Scrap Tires — Remediation

Transportation & Markets

Tribal Lands and the Environment:
A National Forum on Solid Waste,
Emergency Response, Contaminated Sites and UST’s
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Agenda

• Overview
• Site Remediation – Different Sites, Different Approaches
• Management Intensive
• Modes - Truck, train, volume reduce, or all of the above.
• Economics/Logistics
• Markets
• Summary
Hand Loaded Tire Cleanup

Common & Simplistic
Contaminated Tire – Landfill or Recovery? Expense vs. Benefit
What you like vs What you get!
Overview

• On average - 25% to 75% of cost to the customer on the cleanup / collection side, 5% or more on the product distribution side.

• Slight gains in efficiencies can affect cleanup costs.

• Creative thinking works to create efficiencies.

• Highly regulated, management intensive.
Highly Regulated Activity
Collection & Processing

- Federal DOT
- Federal Registration
- State PUC's
- Intermodal Authority
- State Regulatory Permitting
- State Manifest &/or Reporting
- State Financial Assurance Requirements
Province’s / State's Transportation Regulatory Oversight = $

- Weight Restrictions
- Length Restrictions (Singles, Doubles, Triples)
- Road Restrictions
- Safety Inspections
- Driver Compliance
Province / State Scrap Tire Haulers Regulatory Permitting

- Regulating Agency Scrap Tire Hauler Permit Requirements
- Operating Requirements
- Reporting Requirements and/or Manifests
- Equipment stickers / equipment tagging
Mode for Moving Tires to Recycling and Disposal

- **Truck**
  - Tractor & trailers
  - Box vans
  - Drop Boxes

- **Railroad**
  - Box Cars, Distance sensitive
  - Intermodal

- **Barge/Ship**
  - Geographic Sensitive
  - Intermodal
Mode

Truck

- Tractor & Trailer Combinations
  - Economy of Scale
  - Customer Accessibility
  - Drop & Pick
  - Standby Load
  - Mechanical or Manual Loading

- Box Van
  - Small Quantity / Tight Location / Manual Load

- Drop Boxes
  - Specialized Equipment (High Cost)
  - Labor (Low Cost)
Mode

Railroad

- **Box Cars**
  - Distance Sensitive – Competitive Rates?
  - Access to Rail Loading – Hard to find.
  - Double Handling = higher cost
  - Approximately 2,500 tires per car

- **Intermodal**
  - Distance Sensitive
  - Access to Intermodal Facility
  - Handling Efficiencies?
Mode
Barge/Ship

- Geographic Sensitive
  - River Barges/Inland Water Barges
    * Flat Deck
    * Open Hold
    * Efficient for Volume Reduced, inefficient for whole tires.
Economics/Logistics

- Drop Boxes - Roll Off Truck
- Pickup / Light Duty Truck / Box Van
- Truck - Trailer Combinations
  - Primary vs. Backhaul
- Volume Reduce Prior to Shipment
# Economics/Logistics

## Drop Box - Roll Off Truck

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Transport services by one person</td>
<td>1. Specialized equipment and higher capital investment.</td>
</tr>
<tr>
<td>2. Drop boxes fit into small areas.</td>
<td>2. Higher Operating Costs</td>
</tr>
<tr>
<td>3. Tire storage container provided to job site. (Secure or unsecured)</td>
<td>3. Without covered box, design allows for illegal dumping into the box.</td>
</tr>
<tr>
<td>4. Easy loading at job site, easy unloading at the recovery site.</td>
<td>4. Open top allows for pilferage.</td>
</tr>
</tbody>
</table>
### Economics/Logistics

**Pickup / Light Duty Truck / Box Van**

<table>
<thead>
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<th>Advantages</th>
<th>Disadvantages</th>
</tr>
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<tbody>
<tr>
<td>1. No CDL required.</td>
<td>1. Only small volumes can be transported, good for short distances.</td>
</tr>
<tr>
<td>2. Easily maneuvered into congested areas.</td>
<td>2. May not service large generators adequately.</td>
</tr>
<tr>
<td>3. Lower operating costs, lower capital investment.</td>
<td>3. Significant portion of drivers time is consumed by hand loading and unloading the tires.</td>
</tr>
<tr>
<td>4. Single employee</td>
<td></td>
</tr>
</tbody>
</table>
## Economics/Logistics

### Truck - Trailer Combinations

<table>
<thead>
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<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Range of trailer sizes permits efficient application of equipment and potential backhauls.</td>
<td>1. Harder to load due to height and volume.</td>
</tr>
<tr>
<td>2. Large tire volumes can be transported each trip.</td>
<td>2. Higher cost to operated if not used efficiently.</td>
</tr>
<tr>
<td>3. Trailers can secure tires from illegal dumping or pilferage.</td>
<td>3. Typically required 2 employees to load if not drop &amp; pick.</td>
</tr>
<tr>
<td>4. Tires are protected from the weather.</td>
<td>4. Long loading and unloading times.</td>
</tr>
</tbody>
</table>
## Economics/Logistics

### Volume Reduce Prior to Shipment

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<th>Disadvantages</th>
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<tr>
<td>1. First step in refinement process.</td>
<td>1. Quality of product difficult to control.</td>
</tr>
<tr>
<td>2. Reduces product volume for maximizing transportation weights.</td>
<td>2. Additional front end capital and R&amp;M costs.</td>
</tr>
<tr>
<td>3. Reduces water holding capacity.</td>
<td>3. Additional 25% - 50% increase in weight may not balance or offset additional front end costs.</td>
</tr>
<tr>
<td>4. Loaded with bulk handling equipment.</td>
<td>4. Need specialized bulk handling equipment for loading.</td>
</tr>
</tbody>
</table>
Economics
Cost Comparison of Options
Assumptions

- Cost Calculated on 50 mile radius
- 50 yard Drop Box holds 500 tires @ $110/hr
- Pickup/Box Van holds 500 tires @ $65/hr
- 2x28' Freight van holds 700x2=1400 tires @ $100/hr
- 53' Freight van holds 1300 tires @ $100/hr
- Incremental Long Haul per 50 miles @ $2.25/mil

(assume 1400 tires per load)

- P= Primary B=Backhaul
Economics

- All Modes

Economic Comparison of Collection Options

<table>
<thead>
<tr>
<th>Collection Modes</th>
<th>Collection Cost $/Tire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Haul B</td>
<td></td>
</tr>
<tr>
<td>Long Haul P</td>
<td></td>
</tr>
<tr>
<td>53' Van</td>
<td></td>
</tr>
<tr>
<td>2x28' Van</td>
<td></td>
</tr>
<tr>
<td>Box Van</td>
<td></td>
</tr>
<tr>
<td>Drop Box</td>
<td></td>
</tr>
</tbody>
</table>

Collection Cost $/Tire:

- 0
- 0.2
- 0.4
- 0.6
- 0.8
- 1
Economics
Economy of Scale for Volume Reduction - Assumptions

- Additional to loading & transport cost.
- Setup and mobilization costs
- Total site operations and loading
- Includes capital and depreciation costs
Economics

- Economy of Scale for Volume Reduction

![Graph showing the relationship between cost per ton and number of tires for a baler and shredder.]
Economics
Volume Reduction vs. Load and Haul 500 Miles - Assumptions

- Tires are collected and brought to central staging area, adds to overall cost represented.
- Tires are being moved to another processing site, not final disposal.
- Increase haul quantities of 56% by volume reduction. (16 tons whole vs. 25 tons reduced.)
- Satellite site cost to manage, process and load included.
- Initial Mobilization Costs can dramatically affect economics which is not necessarily represented here.
- Comparison with a backhaul. **Economics A**
- Comparison without a backhaul. **Economics B**
Economics A

- Volume Reduction vs. Load and Haul 500 Miles with Backhaul ($0.825/tire base cost to load and haul)
Economics B

- Volume Reduction vs. Load and Haul 500 Miles with No Backhaul — ($1.625/unit is base cost to load and haul)
Economics

Volume Reduction vs. Load & Haul 125 miles - Assumptions

- Tires are collected and brought to central staging area, adds to overall cost represented.
- Tires are being moved to another processing site, not final disposal.
- Increase haul quantities of 56% by volume reduction. (16 tons whole vs. 25 tons reduced.)
- Satellite site cost to manage, process and load included. Tires are being moved to another processing site, not final disposal.
- Haul distance is 125 miles, no backhaul, Economics C
Volume Reduction vs. Load & Haul 125 miles – favors no volume reduction, assumes base load and haul at $0.426/unit.
Diesel Fuel - Cost Crisis
A Game Changer

• Price Fluctuations are extreme.
  - Reaction Mode

• Impact on Hauling Cost
  a) Class 8 Trucks
    - $0.10/gal. increase = $0.014 per mile
    - $0.70/gal. increase = $0.10 per mile
    - Small fleet with 1 million mile per year
      increases cost $100,000 per year.

• Fuel Surcharge
  - Allow to Float – Adjust Rapidly
  - Reflects true cost adjustments.
Diesel Fuel Costs
Markets = Beneficial End Use

“A Site Specific Exercise”

• Many Options – Which, if any, are economical?
  • Civil Engineering
    – Tire Derived Aggregate
      » Alternative Daily Cover
      » Lightweight Fill
      » Drainage / Filtration Aggregate
  • Energy
    – Tire Derived Fuel …..Domestic / Export
      » Cement Kilns
      » Industrial Power Boilers
      » Electrical Utilities
End Use – Waste Water Treatment
End Use – Light Weight Fill
1880 On Ramp – Milpitas, CA

Dixon Landing Road
7/13/2001
End Use – Whole Tires For Fuel Cement Kiln
Markets = Beneficial End Uses
(continued)

• Crumb Rubber
  – Manufactured Goods
    » Rubber Mats
    » Highway Safety Cones, Pavers, Garden Hoses, etc.
  – Rubber Modified Asphalt
  – In Fill Aggregate
    » Athletic Fields
    » Playgrounds
    » Colorized Mulch

• Pyrolysis