Initial Carpet Collection Logistics
SE Region Case Study

Dr Matthew J Realff
School of Chemical & Biomolecular Engineering
Georgia Tech/NSF

Dr Tiravat Assavapokee
Department of Industrial Engineering
University of Houston

Dr Jane Ammons & Josh Pas
School of Industrial & Systems Engineering
Georgia Tech
Where should the Collection Hubs be located?

Which Collection Centers should ship directly to the customer?

Which Carpet Sources should be selected?

What tasks (sorting & baling) should be done and where?
Alternative Task Structures

Unbaled Unsorted Carpet → Truck → Collection Hub
  ▶ Sort Carpet → Bale Carpet
  ▶ Landfill Residual
  ▶ Customer

Unbaled Unsorted Carpet → Truck → Collection Center
  ▶ Truck
  ▶ Collection Hub
  ▶ Customer

Rail

Customer
Model Parameters

**Truck Transportation**

- 44,000 lbs baled
- 30,000 lbs unballed

Cost per truckload mile:
- 140 miles: $7.57
- 250 miles: $2.6

Cost breaks at distance:
- $3.6

Rail 1/10th the cost of trucks per ton mile has a fixed cost, but is significantly cheaper.

Carpet must be baled to shipped by rail.
Model Parameters II

Carpet returns are assumed about 70% of new sales. We only consider locations with more than 150,000 sq yard of carpet sale.

<table>
<thead>
<tr>
<th>Process Type</th>
<th>Fixed Cost/Month</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Millions lbs/month</td>
</tr>
<tr>
<td>Sorting</td>
<td>$2610</td>
<td>1.5</td>
</tr>
<tr>
<td>Horizontal Baler</td>
<td>$4900</td>
<td>1.9</td>
</tr>
<tr>
<td>Vertical Baler</td>
<td>$4870</td>
<td>0.26</td>
</tr>
</tbody>
</table>

Collection Center $2100/month to open, $4,800 fixed operating cost per shift per month

Local Variable Collection Cost is 30 mile truck trip cost per loose lb collected

Hubs Cost $4200/month to open, $12,000 fixed operating cost per shift per month

Landfill Fee $35/ton
Model Objectives

- Minimize total cost of collection and transport of:
  - N6 Carpet to a location in Georgia from the SE region states (AL, FL, GA, NC, SC)
  - N6 Carpet to a location in Georgia from the SE region states (AL, FL, GA, NC, SC) assuming you double from the amount above.

N6 Carpet is assumed 33% of Total Carpet Stream
## Model Studies

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume N6</td>
<td>30 million lbs</td>
</tr>
<tr>
<td></td>
<td>Double to 60 million lbs</td>
</tr>
<tr>
<td>Participation Rate*</td>
<td>40%</td>
</tr>
<tr>
<td>Rail Available?</td>
<td>Yes or No</td>
</tr>
</tbody>
</table>

* In the locations selected 40% of the volume is assumed to be able to be collected.
### Results I

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<tr>
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<tr>
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</tr>
</tbody>
</table>

- Monthly Cost: $450,000

Blue = Regular Site  
Green = Hub Site
Cost Breakdown

- Opening Cost: 8.33%
- Collection Cost: 35.06%
- Processing Cost: 20.34%
- Transportation Cost: 20.18%
- Additional Cost: 16.09%
Results II

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<tr>
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<td>Volume N6</td>
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<td>Participation Rate</td>
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<tr>
<td>Rail Available?</td>
<td>Y</td>
</tr>
</tbody>
</table>

Monthly Cost: $403,000

Blue = Regular Site  Green = Hub Site
### Results III

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume N6</td>
<td>60 million lbs</td>
</tr>
<tr>
<td>Participation Rate</td>
<td>40%</td>
</tr>
<tr>
<td>Rail Available?</td>
<td>N</td>
</tr>
</tbody>
</table>

Monthly Cost: $1,150,000

**Map:**
- Blue = Regular Site
- Green = Hub Site
Results IV

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>Volume N6</td>
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Monthly Cost $1,000,000

Blue = Regular Site  Green = Hub Site
Summary

• Very flexible model of initial carpet collection.
  – All the model parameters can easily be changed
  – New customers for carpet types can be added
  – New processes for carpet can be added
• Model can be used to study sensitivity to assumptions.
• Model can be used to benchmark systems and explore opportunities in silico.