### Baseline Vehicle Material Composition

<table>
<thead>
<tr>
<th>Material</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastics</td>
<td>224.5</td>
</tr>
<tr>
<td>Aluminum</td>
<td>155.5</td>
</tr>
<tr>
<td>Copper</td>
<td>49.5</td>
</tr>
<tr>
<td>Zinc</td>
<td>20.0</td>
</tr>
<tr>
<td>Lead</td>
<td>----</td>
</tr>
<tr>
<td>Other Ferrous</td>
<td>68.5</td>
</tr>
<tr>
<td>Iron</td>
<td>459.0</td>
</tr>
<tr>
<td>Carbon Steel</td>
<td>1387.0</td>
</tr>
<tr>
<td>HSS</td>
<td>234.0</td>
</tr>
<tr>
<td>Stainless</td>
<td>31.0</td>
</tr>
<tr>
<td>Glass</td>
<td>85.0</td>
</tr>
<tr>
<td>Rubber</td>
<td>134.5</td>
</tr>
<tr>
<td>Fluids</td>
<td>179.5</td>
</tr>
<tr>
<td>Other</td>
<td>83.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3111.0</strong></td>
</tr>
</tbody>
</table>

- **"Unrecyclable"**
- **"Nonferrous"**
- **"Ferrous"**
- **"Unrecyclable"**
Estimated Costs of Recycling Processing

Assumptions:
- Cost of Hulk - approx. $50
- 70 ton/hr shredder
- 8 hrs/day operation
  - 4 hrs/day maintenance
- Transportation Costs - $0.10/ton/mi

- Regression: Cost / Vehicle

\[
\text{Cost} = -48.7820 - 0.0153 \text{ F} - 0.0079 \text{ N} - 0.0072 \text{ U}
\]

- Where:
  - F = Car Ferrous Mass (lbs)
  - N = Car Non-Ferrous Mass (lb)
    (not including lead)
  - U = Car Unrecyclable Mass (lb)
Rules of Thumb for Revenue & Landfill Expenses

- Cost of Landfill --- $120/ton
- Value of Ferrous Scrap --- $100/ton
- Value of Mixed Nonferrous Scrap --- $900/ton
- Separation Efficiencies --- 90% of ferrous recovered
- 90% of nonferrous recovered
- rest goes to landfill

- Dismantlers Get Some Off Before The Shredder:
  50% of the Iron
  80% of the Stainless
  50% of the Aluminum
  25% of the Copper
  50% of the Glass
  50% of the Rubber

- This is a function of the kinds of parts made of these materials.

- For the purposes of this analysis, use the regressions to calculate the costs of the baseline vehicle. Then use the top 4 bullet facts to look at the impact of changes in the vehicle material composition.
Ferrous Metal Revenue - Estimated

Assumed
- $100/ton shredded steel scrap
- Standard Processing

Regression Results From Cost Model
- Where (all in pounds):
  - \( F \) = total ferrous mass of car
  - \( N \) = total nonferrous mass (net of battery lead)
  - \( U \) = total mass of unrecyclable

Result: - in dollars per vehicle

\[
2.2248 + 0.0376 F + 0.0055 N - 0.0068 U = \text{Ferrous Revenue}
\]
Non-Ferrous Metal Revenues - Estimated

More Detailed Estimate
- Recovery Rates of Aluminum, Copper, and Zinc Different
- Overall Mixed Metal Scrap Value Assumed At $0.45/lb

Result-Dollars per vehicle:

Revenue = 0.2025 Al + 0.3038 Cu + 0.4050 Zn

where: Al = total aluminum in car
Cu = total copper in car
Zn = total zinc in car

Note: Aluminum companies are being pressed to offer higher scrap values!
Landfill Cost Estimate

Assumptions:
- Landfill Cost - $120/ton
- Separations Not 100% Efficient

Results: Landfill Cost Per Vehicle

\[
\text{Cost} = 6.9382 - 0.0018 F + 0.0041 N - 0.0574 U
\]

Where:
- \( F \) = Car Ferrous Mass (lbs)
- \( N \) = Car Non-Ferrous Mass (lb) (not including lead)
- \( U \) = Car Unrecyclable Mass (lb)