The Sustainable Materials Management Webinar Series

Recycled Rubber Industry Update

Tuesday March 18, 2014/1:30 – 2:45PM ET

Presenter:

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Pennsylvania Recycling Markets Center

National Recycling Coalition, Inc.
SCRAP TIRE MARKETS

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Washington, DC
Pennsylvania Market Development webinar
March 18, 2014
Understanding the Scrap Tire Marketplace

- Scrap tire markets are demand pull
- Not supply side driven
- Supply is usually not the limiting factor
- Processing tires is not recycling tires
- Different specs for different markets
- Having multiple markets is both possible & necessary
Quick History of U.S. Scrap Tire Management

1985
- Minnesota was the first state to enact scrap tire legislation and regulations

1988-1989
- National focus on recycling – Congress considering laws on secondary materials including tires

1990
- 48 states had scrap tire laws or regulations of some kind
- 1990: 11% of scrap tires went to end-use market (TDF)
- EPA stated there were 2-3 billion tires in stockpiles in the US
- RMA formed Scrap Tire Management Counsel to promote scrap tire markets

Today
- Congressional interest has long since waned
- RMA recognized as leading source of information on all scrap tire issues
- Scrap tire markets have increased to over 80% of scrap tires generated
- Over 90% of all stockpiles have been abated
- RMA leadership continues

Quick History of U.S. Scrap Tire Management
End Use Markets

- Tire-derived fuel
- Ground rubber
- Tire-derived aggregate
- Material recovery
Tire-Derived Fuel

- Cement kilns
- Pulp & paper mill boilers
- Utility boilers
- Industrial boilers
- Dedicated scrap tire-to-energy
- Blast furnaces
- Resource recovery facilities
Tire-Derived Fuel

- Combustion emissions within all limits
- Widely accepted supplemental fuel
- Considered a fuel by EPA
- Cost competitive fuel
- Tire chip quality improving (-1.5 inch)
- Major market for abatement tires
Tire-Derived Aggregate

- Defined as: Use of tires (shreds) in lieu of conventional construction materials
  - Sand / Clean fill / Rock
- Four general uses:
  - Road construction
  - Landfill construction
  - Septic field drainage medium
  - Vibration dampening (light rail)
Civil Engineering Applications

CONSTRUCTION
• Light-weight backfill
• Road embankments
• Road base
• Septic field medium
• Basement insulation

IN LANDFILLS
• Leachate liners
• Gas venting backfill
• Operational liners
• Cap closure material
• Alternative daily cover
TDA

• Given supply/economics of conventional aggregate, TDA use has competitive advantage in 5 applications
  – Light weight fill
  – Septic field drainage medium
  – Vibration dampening
  – Landfill applications
  – Road base (unpaved roads)
Civil Engineering Applications

- Tire Bales
  - Began in mid 1980’s
  - Used in Southwest USA (NM/TX)
- Tire baling is not recycling: not good or bad: it’s a form of tire processing
- Regulatory agencies looking for “engineered” projects (P.E. stamp)
Ground Rubber (crumb)

• Four general size classifications
  – Buffings
  – Coarse rubber $\frac{1}{2}$” - 4 mesh
  – Ground rubber 10 – 40 mesh
  – Fine grind rubber 80 – 400 mesh

• Different markets for different sizes
Ground Rubber

• Tire Buffings
  – Asphalt
  – Bound rubber products (mats)

• Coarse Rubber
  – Playground cover
  – Running tracks
  – Soil Amendments
  – Mulch
Ground Rubber

• Ground Rubber
  – Asphalt
  – Molded/extruded products
  – Infill

• Fine Grind Rubber
  – Tires
  – Rubber/plastic compounds
Material Recovery

• Electric Arc Furnaces (EAFs)
  – Carbon recycling
  – Steel recycling
  – Energy recovery
# U.S. Scrap Tire Generation 2011

<table>
<thead>
<tr>
<th>Tire Class</th>
<th>Millions of Tires</th>
<th>Market Percentage</th>
<th>Average Weight (lbs)</th>
<th>Weight (tons)³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Duty Tires</td>
<td>237.8</td>
<td>89.5%</td>
<td>22.5</td>
<td>2675.1</td>
</tr>
<tr>
<td>Passenger tire replacements¹</td>
<td>194.4</td>
<td>73.1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light truck tire replacements¹</td>
<td>28.6</td>
<td>10.8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tires from scrapped Cars²</td>
<td>14.8</td>
<td>5.6%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial Tires</td>
<td>28.0</td>
<td>10.5%</td>
<td>120.0</td>
<td>1680.9</td>
</tr>
<tr>
<td>Medium, wide base, heavy truck</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>replacement tires¹</td>
<td>16.5</td>
<td>6.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tires from scrapped trucks and</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>buses²</td>
<td>11.5</td>
<td>4.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total tires hauled</td>
<td>265.8</td>
<td>100.0%</td>
<td>32.8</td>
<td>4356.0</td>
</tr>
<tr>
<td>Used tires culled</td>
<td>35.1</td>
<td>13.2%</td>
<td>32.8</td>
<td>575.0</td>
</tr>
<tr>
<td>Net scrap tires</td>
<td>230.7</td>
<td>86.8%</td>
<td>32.8</td>
<td>3781.0</td>
</tr>
</tbody>
</table>


²Ward's Motor Vehicle Facts and Figures, 2012. Includes the number of vehicles removed from service in the car/light truck, truck and bus categories in 2011. Assumes two tires scrapped from light duty vehicles and 2.5 tires scrapped from trucks and buses.
# U.S. Scrap Tire Disposition 2011

<table>
<thead>
<tr>
<th>Market of Disposition</th>
<th>Thousands of Tons</th>
<th>Millions of Tires</th>
<th>% change 2009-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tire-Derived Fuel</td>
<td>1427.03</td>
<td>87.08</td>
<td>-31.5%</td>
</tr>
<tr>
<td>Ground Rubber</td>
<td>928.50</td>
<td>56.66</td>
<td>-20.2%</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>294.99</td>
<td>18.00</td>
<td>3.5%</td>
</tr>
<tr>
<td>Exported</td>
<td>302.48</td>
<td>18.46</td>
<td>196.3%</td>
</tr>
<tr>
<td>Electric Arc Furnace</td>
<td>65.55</td>
<td>4.00</td>
<td>141.9%</td>
</tr>
<tr>
<td>Reclamation Projects</td>
<td>54.29</td>
<td>3.31</td>
<td>-58.2%</td>
</tr>
<tr>
<td>Agricultural</td>
<td>7.10</td>
<td>0.43</td>
<td>0.0%</td>
</tr>
<tr>
<td>Baled Tires/market</td>
<td>1.92</td>
<td>0.12</td>
<td>0.0%</td>
</tr>
<tr>
<td>Punched/Stamped</td>
<td>1.90</td>
<td>0.12</td>
<td>0.0%</td>
</tr>
<tr>
<td>Total to Market</td>
<td>3235.89</td>
<td>197.45</td>
<td>-17.4%</td>
</tr>
<tr>
<td>Generated</td>
<td>3781.03</td>
<td>230.72</td>
<td>-17.7%</td>
</tr>
<tr>
<td>% to Market/Utilized</td>
<td>81.6%</td>
<td>81.6%</td>
<td>N/A</td>
</tr>
<tr>
<td>Land Disposed</td>
<td>491.65</td>
<td>30.00</td>
<td>-24.8%</td>
</tr>
<tr>
<td>Baled/no market</td>
<td>32.78</td>
<td>2.00</td>
<td>110.5%</td>
</tr>
<tr>
<td>% Managed (includes Markets,</td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Baled and Landfill)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processor Inventory/Unknown</td>
<td>4.6%</td>
<td>4.6%</td>
<td>N/A</td>
</tr>
</tbody>
</table>
U.S. Scrap Tire Trends 2005 - 2011

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Generated</th>
<th>Total to Market</th>
<th>Utilization %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>3616.1</td>
<td>4410.7</td>
<td>82.0%</td>
</tr>
<tr>
<td>2007</td>
<td>4105.8</td>
<td>4595.7</td>
<td>89.3%</td>
</tr>
<tr>
<td>2009</td>
<td>3917.7</td>
<td>4595.5</td>
<td>85.3%</td>
</tr>
<tr>
<td>2011</td>
<td>3781.0</td>
<td>3083.8</td>
<td>81.6%</td>
</tr>
</tbody>
</table>
U.S. Scrap Tire Disposition 2011*
(percent of total tons generated annually)

* Numbers may not add due to rounding.
Preliminary 2013 Market Data

- Scrap tire generation above 304 million tires
- TDF markets have increased by 30%
  - Pulp mills major driver
- Ground rubber markets have increased to 1.3 billion pounds
- TDA markets have been stagnant
- All other markets of minor importance
- Overall recovery percentage close to 89%
Other Technologies

• Pyrolysis
  – 2 companies actively being developed
  – No commercial operation
  – Interest continues: still no results
  – At best: a minor market factor

• Devulcanization
  – Continues to be of interest
  – No known activity
  – Unlikely to be a market factor
U.S. Stockpiled Scrap Tires 1990 - 2011

Millions of Tires

- 1000.00
- 685.39
- 509.98
- 308.45
- 271.79
- 180.36
- 142.27
- 127.60
- 125.04
- 76.73

1990
1992
1994
1996
2001
2003
2005
2007
2009
2010
2011
2020
U.S. Scrap Tire Stockpiles 2013

Number of Tires in Stockpiles:
- None (0% of total)
- Less than 1 million (6% of total)
- Less than 5 million (18% of total)
- Less than 10 million (17% of total)
- Less than 20 million (15% of total)
- More than 20 million (40% of total)
- Did not report or unknown
Market Development

• Many end use markets are influenced by state agencies
  – DOTs & rubber modified asphalt
  – DOH & TDA

• State agencies can support new markets by providing information on human & environmental issues
  – Infill, loose fill playground, mulch
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QUESTIONS?

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