Role of USEPA in Promoting Safe, Beneficial Uses of Industrial Materials

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Agricultural and Industrial Uses of FGD Gypsum
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Industrial Materials Recycling

• Safe recycling of industrial materials, including FGD gypsum, can result in significant environmental benefits, including
  – resource conservation,
  – decreased energy use,
  – decreased greenhouse gas emissions, and
  – decreased ecological damage associated with materials extraction.
Primary Considerations in Beneficial Use

- Engineering and/or Agricultural Considerations
  - Is there an industrial material that can effectively substitute for a commonly used virgin material?

- Market Considerations

- Environmental Benefits

- Environmental Safety
  - What’s in it?
  - How will it be used?
    - Primary uses
    - Secondary uses
  - What are the application rates?
  - Will it accumulate onsite?
  - Will it migrate offsite?
EPA’s Role

• Our role in promoting recycling is to
  – Bring stakeholders together,
    • Coordinate efforts to increase safe recycling,
  – Provide our technical expertise, and
  – Provide tools.

• The Resource Conservation Challenge (RCC) is a national effort led by EPA to conserve natural resources and energy by managing materials more efficiently.
  – The Coal Combustion Products Partnership (C2P2) is a collaborative program with 160 partners to promote the beneficial use of coal combustion products.
EPA’s Role: Quantifying Benefits

- To quantify the benefits of recycling CCPs, foundry sand, C & D materials, scrap tires and asphalt shingles, OSW is performing life-cycle analyses.

<table>
<thead>
<tr>
<th>Coal Ash Recycling: 2006 National Data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Substitution for Portland Cement in Concrete</td>
<td></td>
</tr>
<tr>
<td>Amount Recycled</td>
<td>15 Million Tons</td>
</tr>
<tr>
<td>Total Energy Savings</td>
<td>80 Trillion BTUs</td>
</tr>
<tr>
<td>Energy Equivalent</td>
<td>638 Million Gallons of Gasoline</td>
</tr>
<tr>
<td>Greenhouse Gas Reduction</td>
<td>3.7 Million Metric Ton Carbon Equivalents</td>
</tr>
<tr>
<td>Greenhouse Gas Equivalent</td>
<td>3 Million Cars off the Road</td>
</tr>
</tbody>
</table>

Source: These figures were estimated using the WARM model, [http://epa.gov/climatechange/wycd/waste/calculators/Warm_home.html](http://epa.gov/climatechange/wycd/waste/calculators/Warm_home.html) and are based on voluntary industry data collected by the American Coal Ash Association.
EPA’s Role: Risk Assessment Framework

• OSW is developing a framework to assist state regulators and others in decision-making concerning risk related to industrial materials recycling.

• Authority to regulate non-hazardous waste has been delegated to the states.
  – States determine what industrial materials can be recycled and how.
    • New materials or new uses of familiar materials may not permitted because decision-makers do not have the resources to evaluate risk.
  – The purpose of the framework is to increase the safe, beneficial use of industrial materials by helping state regulators assess risk.
EPA’s Role: Risk Assessment Framework (Cont.)

• Presents approaches for assessing suitability of industrial materials for safe recycling.

• Library of tools contains information on and links to resources that can aid in risk assessment
  – Test methods to characterize materials
  – IWEM and other groundwater models
  – Other tools
Considering Use of FGD Gypsum

• Environmental Benefits
  – Decreased soil erosion and
  – Reduction in energy use, greenhouse gas emissions, and ecological damage associated with materials extraction.

• Environmental Considerations
  – Are there constituents of potential concern (e.g., trace metals) in FGD gypsum?
  – What concentrations are present in FGD gypsum, and how do they compare to the concentrations in mined gypsum?
  – What are the potential ecological and human health risks caused by proper or improper use?
## Trace Constituents in FGD Gypsum, Mined Gypsums, and Natural Soils

<table>
<thead>
<tr>
<th>Trace Constituent</th>
<th>FGD Gypsum (ppm)</th>
<th>Mined Gypsum (ppm)</th>
<th>National Background in Soils Lower 25(^{th}) percentile (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antimony</td>
<td>2.0 – 9.1</td>
<td>0.02 – 0.28</td>
<td>0.3</td>
</tr>
<tr>
<td>Arsenic</td>
<td>0.6 – 4.0</td>
<td>0.19 – 3.0</td>
<td>4.21</td>
</tr>
<tr>
<td>Cadmium</td>
<td>0.2 – 1.2</td>
<td>&lt;2 – 0.5</td>
<td>0.19</td>
</tr>
<tr>
<td>Chromium</td>
<td>1.3 – 42.0</td>
<td>8.7 – 30.5</td>
<td>28.6</td>
</tr>
<tr>
<td>Lead</td>
<td>0.8 – 12.0</td>
<td>All &lt;5</td>
<td>14.5</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.01 – 1.4</td>
<td>0.00044 – 0.025</td>
<td>0.039</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>0.5 – 12.0</td>
<td>All &lt;3</td>
<td>0.44</td>
</tr>
<tr>
<td>Nickel</td>
<td>0.73 – 20.1</td>
<td>&lt;4 – 11.9</td>
<td>11.8</td>
</tr>
<tr>
<td>Selenium</td>
<td>2.0 – 30.0</td>
<td>11.3 – 21.1</td>
<td>0.21</td>
</tr>
<tr>
<td>Thallium</td>
<td>0.6 – 2.0</td>
<td>All &lt;15</td>
<td>0.3</td>
</tr>
<tr>
<td>Vanadium</td>
<td>&lt;1 – 73.0</td>
<td>&lt;2 – 12.7</td>
<td>45.9</td>
</tr>
<tr>
<td>Zinc</td>
<td>3.4 – 47.5</td>
<td>13.1 – 27.5</td>
<td>36.8</td>
</tr>
</tbody>
</table>

Information Gaps

• It is important to establish acceptable product specifications for agricultural FGD gypsum.
  – Farmers need to know what they are getting.
  – FGD gypsum can be processed to reduce the concentration of heavy metals.

• Mercury concentrations are typically higher in FGD gypsum than in natural gypsum sources.
  – EPA would like to see more research on potential environmental releases from use of FGD gypsum in agriculture and other recycling applications.
Final Points

- EPA encourages the safe, beneficial use of industrial materials, including FGD gypsum.
- Product specifications could help potential users in making decisions about utilizing FGD gypsum.
- It is important to characterize and consider risk associated with the use of industrial materials.
  - There is nothing that will set the IMR effort back more than a real or perceived human health or environmental risk.
- OSW is currently developing a framework to assist state regulators and others in decision-making concerning risk related to industrial materials recycling.