# 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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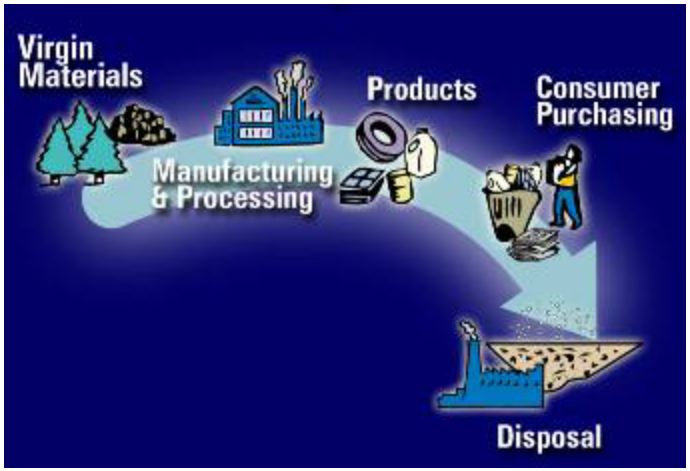
# Industrial Materials Recycling





- 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.

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

Source: These figures were estimated using the WARM model, 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 | | | |
|---|---|---|---|
| Trace Constituent | FGD Gypsum (ppm) | Mined Gypsum (ppm) | National Background in Soils Lower 25th percentile (ppm) |
| Antimony | 2.0 – 9.1 | 0.02 – 0.28 | 0.3 |
| Arsenic | 0.6 – 4.0 | 0.19 – 3.0 | 4.21 |
| Cadmium | 0.2 – 1.2 | <2 – 0.5 | 0.19 |
| Chromium | 1.3 – 42.0 | 8.7 – 30.5 | 28.6 |
| Lead | 0.8 – 12.0 | All <5 | 14.5 |
| Mercury | 0.01 – 1.4 | 0.00044 – 0.025 | 0.039 |
| Molybdenum | 0.5 – 12.0 | All <3 | 0.44 |
| Nickel | 0.73 – 20.1 | <4 – 11.9 | 11.8 |
| Selenium | 2.0 – 30.0 | 11.3 – 21.1 | 0.21 |
| Thallium | 0.6 – 2.0 | All <15 | 0.3 |
| Vanadium | <1 – 73.2 | <2 – 12.7 | 45.9 |
| Zinc | 3.4 – 47.5 | 13.1 – 27.5 | 36.8 |

Sources: DOE. 2007. Unpublished data. U.S. Department of Energy; EPA. 2007. Unpublished data. Office of Research and Development, U.S. Environmental Protection Agency; EPRI. 2007. Unpublished data. Electric Power Research Institute; OSU. 2006. *Gypsum for Agricultural Use in Ohio--Sources and Quality of Available Products*. Ohio State University Extension Fact Sheet, ANR-20-05. http://ohioline.osu.edu/anr-fact/0020.html; Shacklette and Boerngen. 1984. *Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States*. U.S. Geological Survey Professional Paper 1270. Washington, D.C.: U.S. Government Printing Office; USGS. 2005. *Major- and Trace-Element Concentrations in Soils from Two Continental-Scale Transects of the United States and Canada*. Open-File Report 2005-1253, U.S. Geological Survey. http://pubs.usgs.gov/of/2005/1253/

# 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.