

Beneficial Use Of Industrial By-Products

- House Bill 5400 sponsored by Rep. Wayne Schmidt
- House Bill 5401 sponsored by Rep. Ed McBroom
- House Bill 5402 sponsored by Rep. Phil Potvin

An Overview

Presented by

Chuck Barbieri of Foster Swift Collins and Smith
on behalf of Michigan Manufacturers Association



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What Are Beneficial Use By-Products?

- Generally, beneficial use involves the use of industrial by-products to replace or supplement a raw material or a competing product. Beneficial use by-products rather than being classified as solid waste are recognized and used for acceptable purposes.

What Purpose Will Beneficial Use Reform Serve?

- Encourages the reuse of materials that would otherwise be disposed as waste.
- Reduces disposal costs for generators and provides economical and environmental savings over other raw materials that would otherwise be needed.
- Assures the safety of the materials for potential uses.
- Extends the capacity of landfills and conserves resources.
- Promotes the concept of sustainability.
- Provides protection against liability if used properly.

Why Statutory Reform is Needed

- Beneficial Use By-Products Are Now Subject to Outdated Regulatory Rules Over 20 Years Old.
- Existing Approval Procedures Are Too Lengthy, Time-Consuming and Costly and Are Based on Rescinded Criteria.
- Experience in Michigan and Other States Show that Materials Can Be Safely Applied.
- Past Rulemaking Efforts Failed (under previous administrations)

Materials defined as Beneficial Use By-Products

- Cement Kiln Dust/Lime Kiln Dust: Particulate matter collected in air emission control devices serving Portland cement kilns and lime kilns
- Coal Bottom or Wood Ash: Ash particles from combustion of coal or any type of ash or slag resulting from wood burning.
- Coal or Wood Ash: Material recovered from air pollution control system or non-combusted residue from combustion of coal, wood or both (although only cementitious ash is suitable for use as fill).
- Dewatered Grinding Sludge from public transportation agency road projects
- Flue Gas Desulfurization Material: Material recovered from air pollution control systems that capture sulfur dioxide during wood, coal or fossil fuel combustion, including synthetic gypsum

Beneficial Byproducts cont'd...

- Foundry Sand: Silica sand used in metal casting process from ferrous or nonferrous foundries
- Lime Softening Residuals from treatment and conditioning of water for domestic use or community water supply
- Mixed Wood Ash: Material recovered from air pollution control system or non-combusted residue from combustion of wood, scrap wood, railroad ties and tires.
- Pulp and Paper Mill Ash: Non-combusted residue remaining after combustion of coal, wood, pulp and paper mill material, wood, biomass pellets, scrap wood.

Beneficial By-products Cont'd...

- Pulp and Paper Mill Material: Materials generated at pulp and paper mill including wastewater treatment sludge; rejects from screens, cleaners and mills; bark, woodfiber and chips; scrap paper and causticizing residues
- Soils Washed or Removed from Sugar Beets
- Spent Media from sandblasting with uncontaminated soil, newly manufactured, unpainted steel
- Stamp Sands: Sand remaining after stamping and processing copper bearing ores

Specific Beneficial Uses for By-Products

- **Beneficial Use 1** means use as aggregate, road material or building material if it will be bonded or encapsulated by cement, limes or asphalt.
- **Beneficial Use 2** means use as construction fill, road base or soil stabilizer, road shoulder material.
- **Beneficial Use 3** means application of material as a fertilizer or soil conditioner under Part 85 or a liming material under 1955 PA 162.
- **Beneficial Use 4** means use to stabilize, neutralize solid, or treat waste; to treat wastewater or sludge; to stabilize hazardous substances, or to serve as landfill construction material.
- **Beneficial Use 5** means soil mixtures using foundry sand and organic material to manufacture soil.

WHAT BENEFICIAL USES CAN BE SERVED BY THESE BY-PRODUCTS?

Beneficial Use by-products

- Cement Kiln Dust/Lime Kiln Dust
- Coal Bottom or Wood Ash
- Coal or Wood Ash
- Dewatered Grinding Slurry
- Flue Gas Desulfurization Material
- Foundry Sand
- Lime Softening Residuals
- Mixed Wood Ash
- Pulp and Paper Mill Ash
- Pulp and Paper Mill Material
- Soil Washed or Removed from Sugar Beets
- Spent Media from Sandblasting
- Stamp Sands

Beneficial Uses

- 1, 2, 3, 4
- 3
- 1, 2 and 4
- 1, 2, 3, 4
- 1, 3
- 1, 2, 3, 4, 5
- 3, 4
- 1, 2, 3, 4
- 1, 2, 3, 4
- 3
- 3
- 1, 2
- 1, 2

Safeguards for Beneficial Uses

- Testing of materials used for Beneficial Use 2 (Fill) and Beneficial Use 3 (Land Application).
- Use standards in case of Beneficial Use 2 and Beneficial Use 3 to limit amount of material and use near groundwater.
- Storage and transportation standards to prevent speculative accumulation; to prevent fugitive releases; and to avoid air, surface water and groundwater releases.
- Regular licensing and registration of land applied materials.
- Simplified reporting and notifications.

Other Needed Reforms to the Solid Waste Act

- Codify and simplify use of **inert materials** such as rock, trees; stumps; uncontaminated soil or sediment, construction brick, masonry or broken concrete used for fill, rip rap, slope stabilization; portland cement clinker, foundry sand used to manufacture soil.
- Expand definition of **source separated materials** to include tires, railroad ties, scrap wood, and recovered paint solids to use as fuel; gypsum dry wall returned to production process; asphalt shingles used to make asphalt or to use as fuel.
- Codify additional materials as low hazard industrial waste which can be disposed less expensively in Type III landfill, including coal or wood ash, cement kiln dust, pulp and paper material, scrap wood, mixed wood ash, tires, asphalt shingles, foundry sand, street cleanings, copper stamp sands.

Needed Reforms to Part 201 (Cleanup Act)

- Liability protection will be provided by redefining “Facility” and “Release” to exclude beneficial use and inert material used in accordance with Part 115.
- Liability protection will be provided for persons who use or store beneficial use byproducts or inert materials in compliance with Part 115.

Consumers Energy Supports HB5400, HB5401 & HB5402

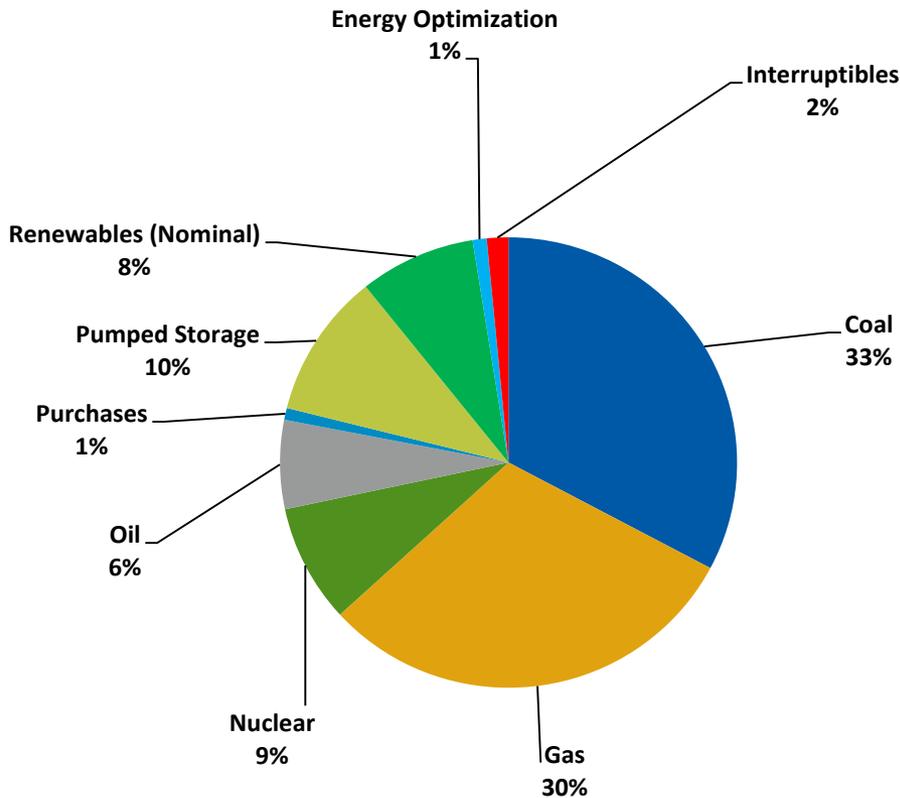
Beneficial Reuse of Industrial By-Products

Gary Dawson
May 22, 2014

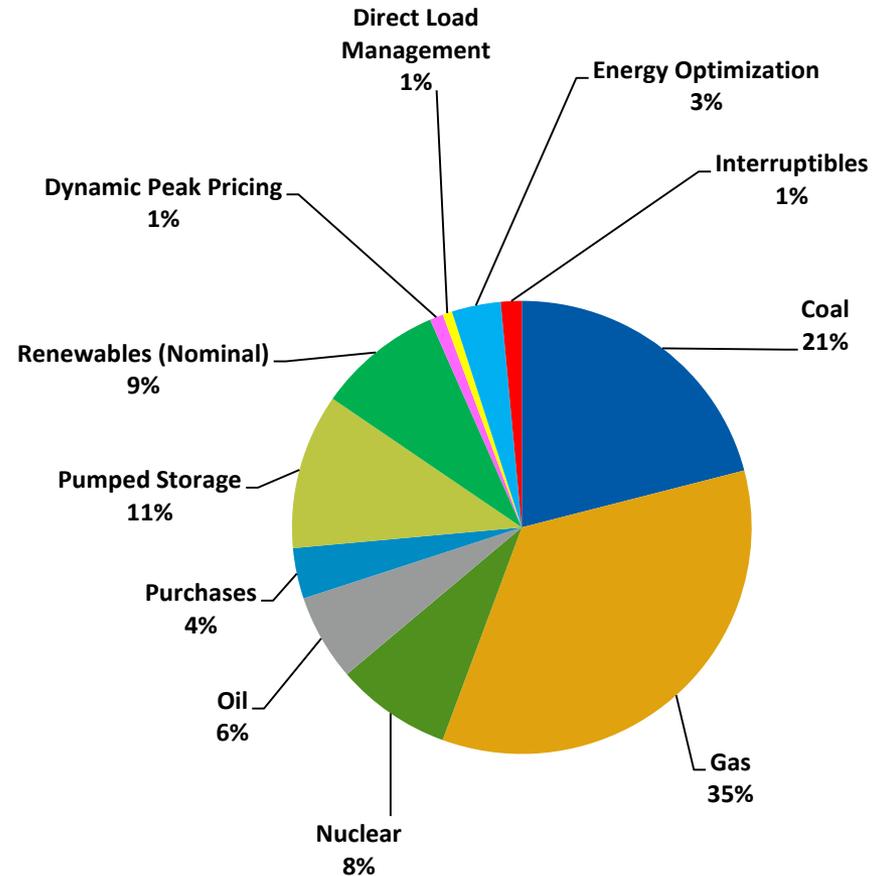
Consumers Energy
Count on Us

Consumers Fuel Mix: Current & Projected

Consumers Energy Capacity Resource Mix in 2013



Consumers Energy Capacity Resource Mix in 2017



Evolving to cleaner generation.

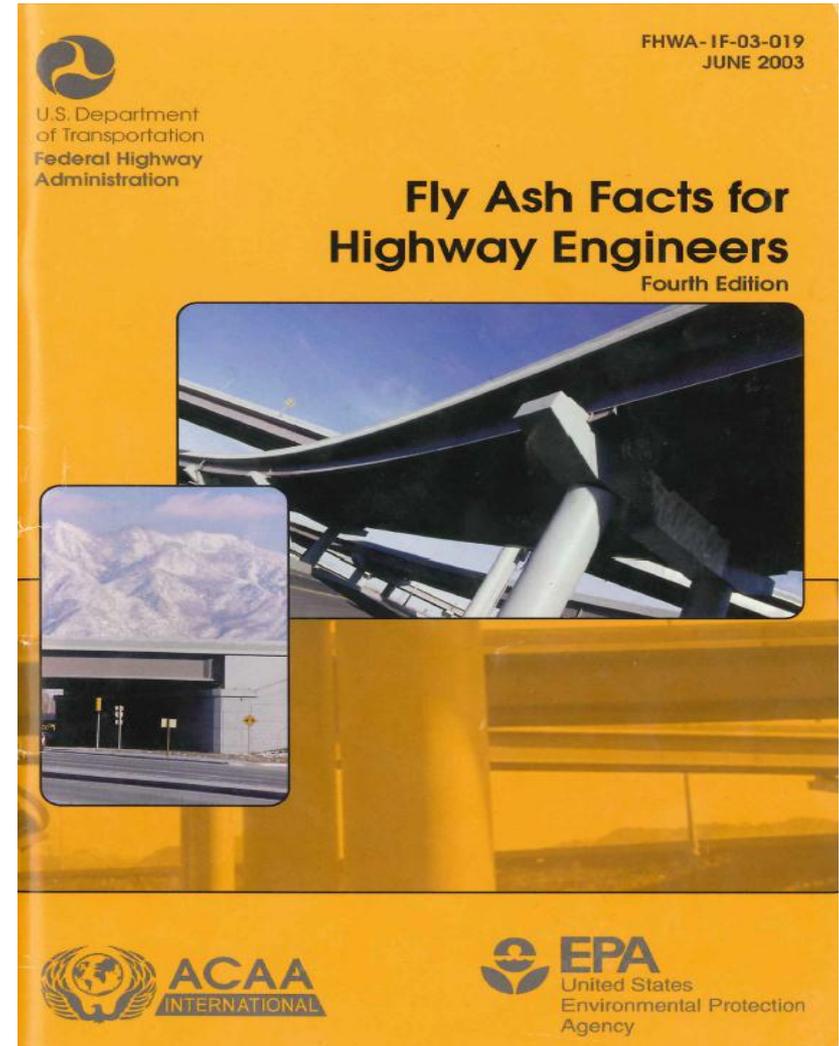
- **Beneficial Reuse of Coal Combustion Products (CCPS)**
 - Today more than 50% (270,000 tons/year) of CE's CCPs are used in Portland cement or redi-mix concrete
 - By 2016 CE's fly ash will be mixed with spray dry absorber (SDA) or dry sorbent injection (DSI) limestone, which will make it an excellent road base material
 - CE's bottom ash (70,000-100,000 tons/year) will continue to be used in Portland cement or as a construction material in MDEQ-licensed landfills in place of sand



- The mercury safeguards set by MDEQ already address the new air quality requirements to remove mercury from the flue gas.
 - If a byproduct does not meet the beneficial use standard then it will not be used.
- Mercury concentrations in ash, CCPs are very low
 - CE leaching tests of ash, CCPs using EPA methods have not detected mercury at 0.2 parts per billion
 - Less than one part per trillion in landfill leachate
- Thus, HB 5400 will not result in mercury concerns for beneficially materials.

Beneficial Reuse of Industrial By-Products

- Many beneficial use opportunities for CCPs in highway applications
- This manual dates to 1986 first edition
 - Ash is widely used in highways in the U.S.
 - More than 22 million tons of fly ash used annually



- **MDEQ's 2005 statewide survey of uncontaminated soils**
 - Many soils naturally contain hazardous substances in excess of Part 201 cleanup criteria
 - Erie and Saginaw glacial lobes-most soil, dredge sediment exceed Part 201 soil or leachate criteria for arsenic.
- **Electric and gas utility operations excavate and/or use of thousands of cubic yards of soil or dredge material**
- **CE landfills tens of thousands of yards of clean soil annually from gas operations-cheaper to landfill than test small batches of soil**
- **The reforms in HB 5400, HB5401 protect both the buyer and seller of uncontaminated native soils from Part 201 liability**

- **Consumers Energy strongly supports HB5400, HB5401 and HB5402**
- **This legislation:**
 - Builds on a strong record of environmental research and stewardship in other states
 - Provide for the safe beneficial use of by-products
 - Will result in energy and natural resource savings
- **Thank you!**

Foundry Sand



Mike Lenahan

President

Michigan Foundry Association

What is a Foundry?



- A place where molten metal is poured into an engineered shape (called a casting).
- The shape of the casting is defined by a mold.
- Molds are typically made of sand.
- “Castings” are used in all manufactured products.

Example of a Sand Mold and a Casting



Foundry Sand



Foundry Sand



Foundry Sand By The Numbers



- National –
Used/Discarded
 - 100 Million Tons
 - 6-10 Million Tons
- Michigan –
Used/Discarded
 - 7 Million Tons
 - 500,000 Tons



Environmental Considerations



- **USDA ARS Study on Foundry Sands**
- “Metal concentrations in the samples were very similar to and often less than metal levels in native U.S. Soils”.
- **EPA Region 5**
- “...sand from iron, steel and aluminum foundries as an ingredient in manufactured soil, soil-less media, and roadway sub-base does not pose a threat to human health or the environment”

Beneficial Use of FGD Gypsum for Agriculture



FGD* Gypsum



- Byproduct of Power Plant Emission Scrubber Systems
- CA SO₂- Chemically identical to mined gypsum with higher purity
- Used in manufacture of 40% of US Wallboard
- Surplus quantities are now available for other beneficial uses
- Multiple Michigan Utilities produce FGD Gypsum

Gypsum in Agriculture



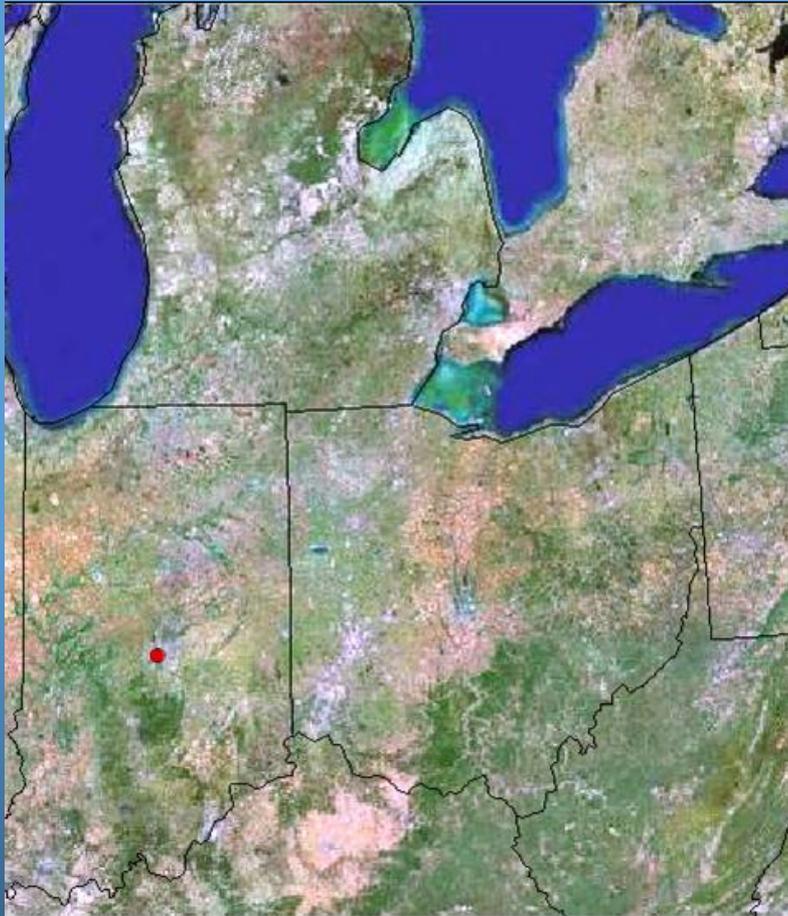
- Used in US agriculture since Colonial times
- Widespread use has been limited by cost of transport from distant gypsum mines
- New sources are now available from power plant emission scrubbers
- Use rapidly expanding as farmers add gypsum to their farming practices

Gypsum's Benefits in Agriculture



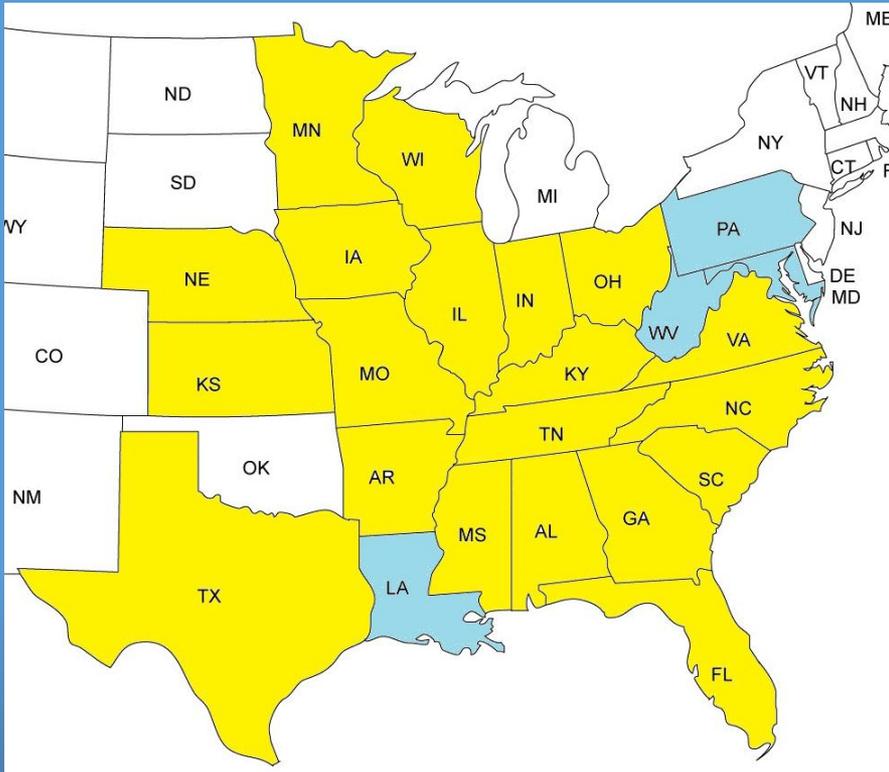
- Essential Nutrients
 - Economical source of sulfur to help address growing sulfur deficiency
 - Calcium needed for crops such as Potatoes
- Soil Amendment
 - Balances soil chemistry/Improves soil structure
 - Deepens rooting zone
 - Increases fertilizer efficiency-reduces input costs
 - Increases Crop Yields
- Improved use of water
 - Increases water infiltration
 - Improves water holding capacity
 - Reduces water runoff

Gypsum as a Tool to Improve Water Quality

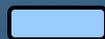


- Gypsum reduces nutrient runoff from farm fields
- Large scale study has demonstrated that use of gypsum can reduce runoff of Soluble Reactive Phosphorous (SRP) into adjoining watersheds by as much as 62%
- NRCS is adopting use of gypsum as a BMP for farmers in sensitive watersheds
- Expanded availability of byproduct gypsum will help clean up nations rivers and lakes

Regulatory Perspective



Permit Pending



Permit Approved



- At least 24 States have permitted FGD gypsum for use in agriculture
- Typically covered under same Department of Agriculture regulations governing other farm inputs including
 - Material testing
 - Handling and storage guidelines
 - Record keeping
- Proposed legislation will bring Michigan in line with other progressive States

Paper Industry By-Products

Paper Industry By-Products

- **Review of beneficial uses for**
 - **Boiler ash**
 - **Agricultural land application**
 - **Soil stabilization and earthen construction**
 - **Concrete additive**
 - **Wastewater treatment residuals**
 - **Agricultural land application**

Markets for Paper Industrial By-Products

Three major markets, each *broadly* defined:

Agriculture



Construction



Energy



For paper industry byproducts

- Agriculture and energy (especially onsite) uses relatively established
- Construction uses, other than earthen construction, relatively untapped

Characteristics of WWTP Residuals

- **Primary WWTP residuals consist mainly of**
 - **Wood fiber**
 - **Inorganic or mineral matter (e.g., clay, CaCO₃, TiO₂)**
- **“Ash” (inorganic) content of primary WWTP residuals ranges from <10% to >70% (dry wt. basis)**



- **Secondary WWTP residuals consist mostly of bacterial biomass (non-pathogenic)**

Agricultural Land Application of Wood Ash

- Soil pH affects the yield and quality of crops, and soils tend to acidify over time
- Agricultural “lime” (e.g., CaCO_3) or other alkaline material can be added to raise the pH of acidic soil
- Wood ash is alkaline (high pH) and can substitute for traditional liming agent
- Wood ash can also be a source of certain nutrients (e.g., Ca, Mg, K, P)
- Wood fly ash most commonly applied, but bottom and combination ashes are too
- As a liming agent, application rate of wood ash ranges from ≈ 1 to 10 tons/acre, typical is on low-end of range



Other Uses for Wood Ash

- **Manufactured soil component**
- **Compost feedstock**
- **Cement kiln ingredient**
- **Concrete additive**
- **Flowable fill component (CLSM)***
- **Mortar and grout additive**
- **Brick additive**
- **Soil stabilization/earthen construction**
- **Waste solidification/stabilization**
- **Landfill daily and intermediate cover**
- **Landfill barrier cover**
- **Mine reclamation/AMD[^] control cover**
- **Supplemental fuel**



* CLSM = controlled low-strength material

[^] Acid mine drainage 37

Wood Ash Use in Soil Stabilization and Earthen Construction

- **Wood and other ashes are used, sometimes with additional materials, to:**
 - **Stabilize soil for roads and other structures**
 - **Construct embankments and other structural fills**
- **Relative to soil stabilization:**
 - **Lime (CaO) addition is a well established technique**
 - **Wood ashes can be high in CaO or can react with added CaO**
- **Field demonstrations have been conducted in Finland using mixtures of fly ash - mostly from wood - and deinking residuals for paved and unpaved roads (reduced frost heave)**
- **In US, mixtures of wood ash and green liquor dregs have been used as fill material (bring lagoons and landfills up to grade) and as base for concrete pad**



Wood Ash as Concrete Additive

- **Concrete is hardened building material formed from a mixture of cement, water, and aggregate (sand and gravel) that has undergone hydration**
- **Various other materials such as coal fly ash are used as “admixtures” (additives) in concrete (partial cement replacement)**
- **Coal fly ash is critical to high-strength concrete and improves concrete workability**



Agricultural Land Application of WWTP Residuals

- **Composition of WWTP residuals varies with manufacturing and WW treatment processes (e.g., primary solids low in N and P)**
- **Depending on characteristics, mill WWTP residuals can serve as a**
 - **Soil conditioner (organic matter)**
 - **Fertilizer (N, P, other plant nutrients)**
 - **Liming agent (soil pH increase via CaCO_3)**
 - **Mulch (weed suppression, erosion control)**
- **Incorporation of mill WWTP residuals or other organic matter can**
 - **Improve soil aeration, water-holding capacity, and microbiology**
 - **Reduce erosion and compaction**
 - **Provide better retention of nutrients and agrochemicals**
- **Studies demonstrate instances where land application of mill WWTP residuals improves soil quality and, especially for “high nutrient” residuals, increases crop yields**

Summary

- **Two significant byproducts from the paper industry are WWTP residuals and boiler ash**
- **Land application is an important beneficial use for both types of materials**
- **There are numerous examples of other uses**
- **Paper companies continue to seek beneficial use opportunities and increasingly explore novel uses**

BENEFICIAL USE BY-PRODUCTS

In Summary

SPECIFIC BENEFICIAL USE BY-PRODUCTS

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