

Interim Research Results Show Foundry Sand Safe for Reuse

Environmental Study of Foundry Sand: Interim Results
EPA Foundry Sand Series

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For more information

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Non-EPA Website:

www.foundryrecycling.org

Citations

The following are references noted throughout this fact sheet:

¹Under development by the Recycled Materials Resource Center (<http://www.rmrc.unh.edu/>).

²Under development by the Ohio State University.

³"Risk Assessment of Spent Foundry Sands in Soil-Related Applications: Peer Review Draft," 2009. Contact Susan Mooney for copies.

⁴For more information contact Libby Dayton, OSU, at Dayton.15@osu.edu, Tim Taylor, EPA, at taylor.timothy@epa.gov, or Rob Dungan, USDA, at robert.dungan@ars.usda.gov.

⁵Due to limited sample size, olivine sands and sands from brass or bronze foundries were not evaluated. The conclusions of this study are limited to non-olivine sands from iron, steel and aluminum foundries.

This fact sheet from U.S. Environmental Protection Agency summarizes the interim results of a collaborative research effort to evaluate the human health and ecological risks of using foundry sand from aluminum, iron, and steel foundries in agricultural and horticultural applications. This is part of a series of fact sheets being developed by members of a national steering committee to find and promote more environmentally safe, beneficial reuses of foundry sand. Other fact sheets in development include (see left-hand box for citations):

- *The Engineering Properties of Foundry Sand*¹
- *The Suitability of Foundry Sand for Infrastructure Applications*¹
- *The Properties of Foundry Sand for Soil Uses*²
- *Foundry Sand Base and Sub-base Applications*¹
- *The Suitability of Foundry Sand for Soil Application*²
- *Foundry Sand for Embankments, Fills and Retaining Walls*¹

Foundry sand basics

The metal industry uses sand as a molding material to make castings. Foundries use high quality sand with consistent physical and chemical properties to ensure uniformity that drives casting quality. Foundry sand is reused and recycled in the metal casting process many times, but it is eventually discarded. Approximately 6-10 million tons are discarded annually. Much of this discarded sand has the potential for reuse in other applications. The foundry industry estimates 28 percent is currently beneficially reused in applications including:

- Road base and Sub-base
- Manufactured soil
- Embankments
- Structural fills
- Hot mix asphalt
- Cement

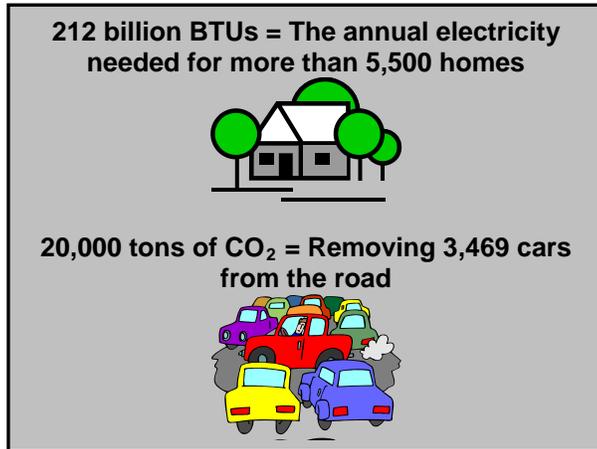
EPA and its government, private and academic partners are actively looking for new uses. Sources of foundry sand can be found via the American Foundry Society's *Metal Facility Sand Locator* program on its Website (www.afsinc.org) under EHS/Governmental affairs.



Interim research results indicate sand used in the metal casting industry to make molds can be safely reused in horticulture and roadway sub-base.

Environmental benefits of reuse

The reuse of foundry sand can conserve virgin resources, and reduce energy use and greenhouse gas emissions. A recent EPA analysis indicates current reuses result in energy savings of 212 billion BTUs per year and prevention of more than 20,000 tons of greenhouse gas emissions.



National risk evaluation

Background

In 2002 a collaborative effort involving U.S. Department of Agriculture-Agricultural Research Service, the Ohio State University, Penn State University, and EPA was initiated to evaluate the risks and benefits of using foundry sand from iron, steel, and aluminum foundries in soil-related applications. In 2009 a report combining the results of this research along with risk modeling results was released for peer review.³

Research Summary

Samples of foundry sand from more than 30 representative iron, steel and aluminum U.S. foundries



A mountain of processed foundry sand at Kurtz Bros. Inc. in northeastern Ohio. Research shows the beneficial reuse of discarded foundry sand deserves the consideration of potential end-users.

were analyzed for total and leachable metals and organic constituents. Laboratory, greenhouse and field studies were also conducted with manufactured soils containing foundry sand. Effects on plants, earthworms and micro-organisms were determined. The results of these studies are available in the scientific literature.⁴

Research results were compared with constituent concentrations in background soils and a risk assessment process was applied. Several potential exposure pathways including inhalation, ground water ingestion and a home garden scenario were modeled. The garden case assumed a manufactured soil 8 inches deep containing 50 percent foundry sand was used to grow produce consumed by the gardener.

Conclusions

- Metal concentrations in the samples were very similar to and often less than metal levels in native U.S. soils.
- The risk assessment demonstrated use of non-olivine 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.⁵

State-specific evaluations

The national risk evaluation provides confidence there is little risk in using foundry sand in soil applications and road base. But it is also important to ensure foundry sand proposed for specific end uses meets state requirements and is well-managed by the foundry. The approval process used to determine if foundry sand can be reused varies across states, but many have approved various applications. For information see the state profiles in www.foundryrecycling.org (non-EPA Website). Please review your state's beneficial use regulations before initiating any project.

The foundry industry has developed a best practices guide to ensure reused foundry sand is characterized, stored and marketed appropriately. It is called *Turning Used Sand into a Marketable Resource: Best Management Practices for Beneficial Reuse*, April 2009, from the American Foundry Society.