CASE STUDY: Foundry Sand as an Alternative Raw Material in the Manufacturing of Cement

Geocycle US (Holcim)
Mason City, Iowa

Geocycle US, based in Dundee, Michigan, is a subsidiary of Holcim (US) Inc. focused on offering customers solutions to their waste management needs by utilizing the co-processing capabilities of cement manufacturing. Co-processing is the substitution of fossil fuels and naturally occurring materials with waste in a manufacturing process. The recoverable materials are diverted from other disposal options such as landfills and incinerators, which preserves natural resources for future generations.

Holcim is one of the largest suppliers of Portland cement and related mineral components in the United States. Founded in 1908, Holcim's Mason City plant has been continuously producing cement for 100 years. Portland cement is made from four elements: silica, aluminum, iron, and calcium. The cement manufactured at Mason City is transported to several regional states to be used as a main ingredient in concrete.

The site receives about 75,000 tons per year of foundry sand, which replaces naturally occurring, virgin silica in the cement production process. Geocycle US currently receives the spent foundry sand from eight regional foundries located in Iowa, Minnesota, Wisconsin, and Illinois, with over half of the foundry sand coming from Grede Foundries, Inc. in St. Cloud, Minnesota. In most cases, Geocycle US and the foundry share the cost of transporting the sand from the foundry's location to the Mason City plant.


Figure 1. Unprocessed core pile.

Depending on the generator, Geocycle US receives the sand in one of two forms: spent dry sand or sand cores. The dry sand may immediately be used in the production of cement, but the core sand contains hard chunks of solid sand that must be ground, screened, and processed before use. What makes the Mason City site unique is not only the amount of foundry sand it receives for co-processing, but also the site's ability to crush and process sand cores on site. Geocycle US at Mason City allows some small foundries the opportunity to re-use their foundry sand, as these foundries may not have the resources to crush and screen their cores before sending them off for co-processing.


Figure 2. Machine that crushes and screens the core sand.

Holcim's use of spent foundry sand in cement production results in several mutual benefits. The foundries avoid landfilling their spent foundry sands, and the Mason City plant reduces the use of a naturally occurring material like virgin sand. Also, the cement manufactured with foundry sand is a sustainable product that meets applicable quality standards and contributes to environmentally friendly applications. In addition, due to the use of recycled sand and other alternative raw materials in its cement products, the Mason City plant has a favorable relationship with the Iowa Division of Solid Waste Management and various other stakeholders.

Both Geocycle US and its source foundries are pleased with their relationship because it results in sustainable development gains for both parties. Several other foundries have expressed interest in working with Geocycle US and Holcim's Mason City plant in the near future.

Figure 3. Machine that dries crushed and screened core sand.

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Personnel	**End User:** Geocycle US (Holcim US) **Foundry:** Grede Foundries, Inc.
Site	**Recycling Location:** Mason City, IA **Site Description:** Holcim's Mason City plant uses spent sand from several foundries for its cement production process. The cement is used as a main ingredient in concrete.
Materials Utilized	75,000 tons per year of spent foundry sand in the form of dry sand or sand cores.
Project Costs and Benefits	**Costs Include:** • Transportation of the sand from foundries to the Mason City plant. • Geocycle US conducts chemical and physical analysis on the sand. • Geocycle US crushes and processes sand cores on site. **Benefits Include:** • The foundries forgo the cost to landfill spent sand. • The Mason City plant avoids the use of naturally occurring materials like virgin sand. • Cement made with recycled foundry sand is a viable option to reduce the environmental footprint for both parties. • Cement manufactured with foundry sand is a sustainable product that meets applicable quality requirements and contributes to environmentally friendly applications. • The Mason City plant has a favorable relationship with environmental regulators and stakeholders.