# Green Foundry Project 2005-01

## Foundry Sand Beneficial Reuse in Cement Manufacture

☒ Full Scale Implementation OR ☐ Pilot Scale/Study

**1. Description of the project: What is the issue and how did you fix it?**

Foundry sand has been disposed as fill and buried in a local quarry for the past 20 years; during peak years, the foundry has generated over 136,000 tons of waste sand (2014). This same year our local quarry informed us they are planning to resume mining operations in the portion of the quarry devoted to foundry sand disposal. Initial Projections showed they were only able to accept our product for 3 more years at the current location. A new outlet had to be sourced to continue normal operations at the foundry.

This project involved selecting a supplier that could re-use our waste foundry sand as a raw product in cement manufacture and divert our waste sand from the local quarry. Foundry sand soil-related application requires thorough sampling by the State due to potential in ground liabilities. In an effort to reduce the environmental impact of this waste on the land, a team was formed to examine the options for reuse versus fill. After a 12 month selection and approval process, a supplier was identified as a possible solution for reuse. The end user is a cement manufacturer (kiln) in Mason City, IA; 83 miles from the foundry.

The first major obstacle we encountered was infrastructure as our offload dock was too short to accommodate shipping. Our waste sand dock was never designed to handle semi-offload and only short heavy steel trailers could fit, hindering our ability to get competitive transportation quotes. Modification to the equipment was rejected due to high capital costs.

The second and overarching obstacle to implementation was cost. Before the concept was proved the team established that the project needed to be cost neutral to the business. The transportation distance increased from 12 miles to 83 miles one way. Initial quotes from the supplier were double our current cost. After 3 months of negotiation our supply management group worked to negotiate a more favorable transportation cost which makes this alternative cost neutral. To do this we were able to identify two items which enabled us to negotiate a better

price. The supplier sourced a trucking company able to meet our height restriction with a modern trailer and was able to provide a better price based on our assurance the material will be pre-screened to less than ¾" diameter, requiring less processing at the kiln. The final price resulted in a $0.65 per ton savings.

The last obstacle to overcome was logistics. Foundry sand offload is unpredictable due to variability in production rates. On-site storage is insufficient for maintaining one shift of production. Foundry sand must be continuously offloaded or downtime is incurred. To prevent downtime by transitioning to a supplier 83 miles away we needed assurances shipping was available during all hours, and we needed to carefully consider how to manage what little existing storage capacity we have and then it was necessary to notify the supplier while minimizing demurrage fees. This aspect has incurred the most teething pain because we needed to re-learn a process that has worked seamlessly for over a decade.

The 1st load of spent sand sent for cement manufacture was Dec 1st, 2015. In the first year of diverting this waste stream, 38,222 tons of Spent Sand were sent for use as a raw product. This is approximately 61% of the total spent sand generated at the foundry. Through a better understanding our processes and product we have continually improved our metrics. In 2019, 42,099 tons of Spent Sand were sent for use as raw product, or 72% of total spent sand generated that year. Additionally, the final price has been negotiated down resulting in a $4.40 per tons savings from 2015.

**2. Environmental Benefits: Conservation of raw materials or energy, reduction or elimination of emissions, wastes, toxics, water discharges, etc.**

This project helped Deere divert 72% of its spent sand , while also helping a cement company avoid the cost of buying new raw product.

**3. Other Benefits: Productivity, health and safety, employee morale, etc.**

By diverting the sand from the quarry we were able to help extend the life of this disposal option and avoid future liabilities of disposing sand in additional quarries.

**4. Cost Savings: Capital cost, operating cost, ROI or other pertinent cost information.**

During the first year of implementation 38,222 tons of sand were diverted with the cost savings was $0.65/ton-sand or $24,844. Subsequent negotiations have resulted in a savings of $4.40/ton sand. In 2019 this was 42,099 tons or $185,235!

**5. Applicability to other foundries and additional Comments**

Yes, but it may not be as viable for all foundries. From the beginning we had a marketable product ready without additional processing. According to the Portland Cement Association, in a 2010 study, of 111 operating Portland cement plants in the US and Canada, only 9 were using foundry sand as a raw product.

Many suppliers we looked at wanted an asymmetrical relationship and were not interested in the effort to make it work. This project reveals that a successful outcome isn't quick or simple, it takes time to overcome hurdles to make a new collaboration work.

**6. Applicable Environmental Categories and Foundry Processes. Select all that apply.**

**Environmental Categories**

☐ Carbon (GHG) Emissions Measurement and Reduction

☐ Air Quality ☐ Water Use and Discharge ☒ Waste Management

☒ Beneficial Use ☐ Stormwater ☒ Material and Resource Conservation

☐ Community Engagement

**Foundry Process(es) Impacted**

☐ Melt ☐ Pour ☐ Mold ☐ Core ☐ sand system/reclaim

☐ Shakeout ☐ Heat Treat ☐ Quench ☐ Finishing ☐Shipping

☐ Maintenance ☐ Pattern Shop ☐ Casting Design

☐ Management Systems and Metrics

☐ Other, explain: Click or tap here to enter text.

**7. Add photos to enhance your application, if applicable.**