



Smith Foundry Company



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Project Background

Smith Foundry Company, located in the Phillips community of Minneapolis, specializes in low/medium production of ductile and grey iron using sand as molds and cores to shape their castings.



“The MnTAP internship gave me the opportunity to learn a new manufacturing industry and understand my weaknesses and strengths. Contrary to class problems, the challenges there were open ended and difficult to tackle. It was fascinating to see how small changes could have substantial outcomes in the past and current projects. Overall, a great experience that I will carry with me through my career path.” ~ AA

Project Background

Smith Foundry Company is looking for means to improve air quality inside and outside of the foundry. This includes switching to a greener binding system for core-making to reduce volatile organic compounds (VOCs), hazardous air pollutants (HAPs), carbon monoxide (CO), and particulate matter (PM), and reducing silica exposure by optimizing silica sand handling. In addition, the company is looking into implementing new technologies to reduce operation costs and waste such as Furness-Newburge Sonoperoxone Blackwater system and Mull-to-Energy system.



“Smith Foundry is committed to providing a safe and healthy workplace for its employees, to improving the environment in the Phillips Neighborhood, and to being a good corporate citizen. For decades our long-term goal has been to develop pollution prevention initiatives that will allow us meet or exceed current city, state, and federal environmental standards. We recently entered into 2 year environmental improvement study with MnTAP. With the assistance of Al Muntasar Al Busaidy, we are developing a program to find environmentally friendly products for our production of castings, to become more energy efficient, and reduce our carbon footprint. With this project, we are confident that we will be able to achieve our pollution reduction goals.”

~ Steve Coozenoy, Smith Foundry

Incentives for Change

Smith Foundry Company feels committed to the community and aims to improve air quality by reducing air contaminants, including particulates, VOCs and HAPs. In addition, a recent change to OSHA silica regulations cut the current standard by 50%: a difficult challenge for most

foundries, since silica sand is a main ingredient in making green sand and cores. This project will reduce operators' health risk and make the working environment safer. Finally, they want to increase their profits by reducing operating costs and reducing waste.

Solutions

Switch to Alternative Binders

Smith Foundry uses industry standard chemical binders to cure and harden silica sand in the core making process, which do emit a certain amount of VOCs, HAPs, CO, and PM during the pouring, cooling, and shakeout phases of production. Switching to newer binder technology will allow the company to produce the same quality cores while reducing the environmental impact.

Implement Blackwater System

The Sonoperoxone Blackwater system applies advanced oxidants and hydroacoustic cavitation to spent green sand and baghouse dust. This enables the clay binder to be reused by restoring the binding effect of the clay. The water used in treating the sand or dust is then used to replace the fresh water currently used for the green sand molds, bringing with it the revitalized clay binder. The process reduces cost by decreasing clay, coal, and sand consumption, while also diminishing air pollution from VOCs and HAPs. Research at 50 iron casting foundries using the system indicates that they use 27-60% less clay and coal, 20-37% less silica sand and produces 19-70% less VOCs during pouring, cooling and shakeout. Further investigation is needed before implementation at Smith Foundry, but these results indicate potential savings of \$30,000 to \$60,000 per year, with reductions of 65 to 140 tons in clay and coal and 250 to 460 tons in silica sand.

Implement Mull-to-Energy System

Since the green sand temperatures and ingredients differ from batch to

batch, mulling for a set amount of time, 90 seconds in the current case, could result in over or under mulling, which degrades molding properties. This results in inconsistent batch to batch mold quality, therefore; more defects and wastes. With the mull-to-energy system, two sensors track the horsepower of the muller motor. Once the energy added to the batch hits a plateau, the muller discharges the batch. Another benefit is speeding the discharging batches to all production streams if the mulling process does not need full 90 seconds, resulting in increased throughput for the entire production process.

Optimize Pipe Design

The amount of silica sand bought annually is 1248 tons, which costs \$46,000. When conveyed with high pressure through 90-degree elbows it degrades and fractures. About 2%, or 25 tons, of the conveyed silica sand breaks into inhalable particulates. The breakage of the sand increases the amount of dust that needs to be captured by dust collectors and eventually goes to a landfill. Therefore, optimizing the pipe design to allow conveying the new silica sand with lower pressure could decrease the degradation of sand, prolonging sand life and reducing silica exposure in the foundry.

Switch from Pneumatic to Electric Tools

Finishing off castings, by removing the extra pieces of material, is heavily dependent on pneumatic grinding tools. Pneumatic tools run on compressed air and are much less efficient than electric tools.



Recommendation	Annual Reduction	Annual Savings	Status
Switch to alternative binders	49 lb. VOCs, 74 lb. CO, 11 lb. HAPs, and 47 lb PM	\$900	Recommended
Install blackwater system	60 tons clay, 250 tons silica sand, and 19% VOCs during pouring, cooling, and shakeout	\$30,000	Under review
Install mull-to-energy system	120,000 kWh	\$8,400	Recommended
Optimizing piping design for new silica sand	25 tons silica sand	\$3,600	Testing
Switch from pneumatic to electric tools	171,000 kWh	\$17,200	Under review

MnTAP Advisor: Jane Paulson, Senior Engineer