

Texas Facility Turns Foundry Sand Into Pay Dirt



It all started when the CFO of Hensley Industries complained about the soaring cost to landfill the facility's spent foundry sand. Tipping fees and transportation had continued to climb over the previous year, peaking at a high of just over \$60,000 per month. Upper management turned to their environmental manager and the company's safety and environmental committee to find a solution. The timing and situation was right to consider something the company had never done: beneficial reuse and recycling. Except for a portion of metal reclaimed from furnace operations, Hensley didn't recycle – *anything*. The environmental manager decided it was time the company changed its attitude and behavior, and what the heck, why not save some money in the process? It wasn't going to be easy. People are quick to say they support recycling, but when it comes to taking a few extra steps down the hall or around the corner, or adding tasks to their job duties, well, that's another matter...

Hensley's environmental manager and the safety and environmental committee investigated potential beneficial reuse applications and end users for its spent foundry sand and furnace slag. The environmental manager also investigated options for recycling office paper, cardboard and wood waste. With limited available physical space, logistic planning for material movement, segregation and storage were of utmost importance. Equipment and labor investment had to be minimal. With the help of the company's purchasing department, the environmental manager made contact with a former colleague who managed a nearby TXI Rebase facility that produces roadbase materials. TXI Rebase was interested in Hensley's foundry sand as a filler and stabilizer. Hensley also entered into partnership with Big City Concrete, a nearby rock and aggregate processor to crush, separate, load and transport the screened sand solids to the roadbase facility. Operation and transport costs were reduced from \$60,000 per month to an average of \$13,500.

During negotiation for the foundry sand beneficial reuse project, Hensley's environmental manager and purchasing department worked with Master Fiber, a company with paper mills in Mexico, and Allied Waste, the company's trash disposal vendor, to set up office paper, cardboard, and wood waste recycling. The facility's trash compactor was being pulled three times a week. With the recycling programs, trash compactor pulls were reduced to once a week. This not only reduced the amount of landfilled plant trash waste by two thirds, but resulted in a cost savings of

Screened Foundry Sand



over \$2000 per month. Wood waste is sent to Consolidated Construction Services, a local wood mulching and blending facility, for half the cost of a compactor pull.



The recycling programs were implemented in stages. The sand screening for beneficial reuse, along with paper and cardboard recycling were started first. Next, wood waste recycling began. Furnace slag screening and crushing were implemented next. Hensley's maintenance and construction managers coordinated the foundry sand screening and hauling, and QBuilding Maintenance, the company's new contract janitorial service, helped the environmental manager and her recycling coordinator with collection and segregation of paper, cardboard, and wood waste for recycling. Hensley's president communicated the importance of the programs to all employees, and the value of the cost savings.



By the end of January 2007, every department was actively involved. The near impossible had been accomplished – the company's culture had changed from red to green. At the end of the company's fiscal year on March 31, 2007, the net cost savings for the sand screening and other recycling programs had reached \$233,000. Another \$283,000 in raw material costs was saved from substitution of virgin scrap steel with reclaimed alloy-bearing steel separated from the sand and slag screening and processing, for a total of \$506,000 net savings. Not a bad way to end one year and begin another. As of November 2007, net savings from all of the recycling programs combined exceeded \$1.1 MM. Approximately 45% of this is directly attributable to recycling and beneficial reuse. The remaining 55% is cost avoided for raw material scrap steel and alloys.

As a result of Hensley's partnership with Big City Concrete and TXI Rebase, the Texas Department of Transportation (TxDOT) has listed Hensley in its state-wide recyclable material generator/supplier database and mapping system, found at http://www.txdot.gov/services/general_services/recycling/recycling_map/mapping_instructions.htm.

In addition to the initial primary cost savings of \$506,000 for the recycling programs implemented in 2007 are secondary cost savings and benefits realized through other recycling, emission reduction, waste minimization, and source reduction. These initiatives, implemented by Hensley's environmental manager and the company's Safety & Environmental Committee, include the following:



- Construction debris reclamation
- Electronics recycling
- Spent core scrubber wastewater
- Hazardous Air Pollutant (HAP) emission reduction
- Drum recycling/return
- Reducing empty containers by using totes or portable tanks
- Recycling supersacks
- Aluminum & copper separately recycled as scrap metals
- Reclamation and reuse of spent carbide graphite furnace electrodes
- Printer and toner cartridge recycling

In October 2007 Hensley completed construction of a new foundry building on the south side of the existing plant property. The new foundry building incorporates the most current production and pollution abatement technologies, including the first large scale envelope filter baghouses in the US. To meet requirements of the Texas construction storm water general permit, construction entrances had to be paved or stabilized to prevent erosion or tracking of material off site.



During ground preparation and excavation for foundation work, significant amounts of old concrete were removed. Additionally, as new pavement was poured, leftover concrete residues were generated. Working with Big City Concrete, Hensley sent old concrete and hardened concrete residues to be crushed and returned to the construction area, where it was used to stabilize construction entrances and sections of the earthen berm surrounding the site. This recycling practice continues today.

Electronics recycling began in mid-2005 as a direct result of networking with ARC International. ARC assisted Hensley with developing an inventory of old computer equipment and other recyclable electronics. Implementing the electronics recycling program also involved education and awareness briefings for key staff and managers in areas that generate obsolete electronic parts and computer equipment. Since the first pickup of three banded pallets of recyclable electronics, Hensley has maintained their successful and mutually beneficial partnership with ARC International through the present.



Carbide electrodes are a dense form of graphite in cylindrical shape. They are used as conduit for the high voltage plasma electricity that melts the scrap steel charge in the electric arc furnaces. Sometimes, the electrodes develop stress fractures or other weakness after periods of use, which results in breakage. Although breakage is infrequent, Hensley had stockpiled several tons of the material over four years. Working with the company's furnace additive supplier Asbury Carbon, Hensley sent a truck load of spent carbide graphite electrodes to Asbury's custom processing facility. Asbury crushed the electrodes to meet Hensley's specifications for potential use as a carbon raiser additive for the furnaces.

The crushed material proved to be an acceptable substitute for granular western coal, which is the raw material normally used. The cost for recycling 17 tons of electrode material is comparable to the cost of the granular coal, and a material otherwise disposed of as landfilled waste is now reclaimed and reused.

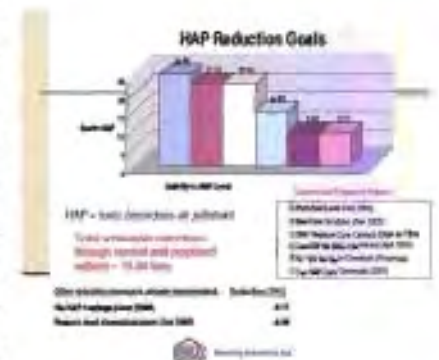
Hensley replaced the wet scrubber used to control catalyst gas emissions from its core making operation. Cores are sand mold inserts used to create voids in metal castings. They are made of special resin coated sand which is hardened by the use of a three-part chemical binder system. After combining Part I and II chemical binders with the resin coated sand in an enclosed box, the formed core is exposed to a volatile organic catalyst gas for several seconds. In this case, the catalyst is triethylamine (TEA), a listed hazardous air pollutant (HAP). The catalyst gas is then evacuated to a wet scrubber to reduce air emissions. The scrubber recirculates a mild acidic water solution which is sprayed inside a tower to entrain the catalyst.



After ten years, the old scrubber was deteriorated and no longer functioned properly as an air emission control device. After replacing the old scrubber with a new unit, Hensley entered into a supplier agreement with Ashland Specialty Chemicals for its core making chemicals. The advantage of partnering with Ashland was access to their Isocycle program. Once the recirculated acidic water is saturated with TEA catalyst, the spent core scrubber wastewater is sent for reclamation. Texas Molecular, under contract to Ashland, reclaims the TEA catalyst from the wastewater, purifies it, and markets it back to Ashland. The advantage to Hensley is that the scrubber water when recycled is exempt from the definition of RCRA solid waste, resulting in reduced regulatory requirements for industrial waste management. Additionally, the cost for recycling the scrubber water through Ashland's Isocycle program is almost half the cost for off site treatment and disposal of the effluent as a non-hazardous waste.



As a result of installing the new core scrubber, HAP emissions of TEA have been reduced by 2.3 tons per year. Additional HAP reduction has been accomplished by switching to no-HAP water based paints for castings finishing, and investigating use of low HAP mold making chemicals. Hensley instituted the use of no-HAP casting paints in 2005, resulting in an overall reduction in HAP emissions of 3.2 tons per year. In early 2006, Hensley investigated low-HAP alternatives to its airset mold making chemicals. Similar to the core making process, airset molds are made using a three part binder system, including a catalyst that hardens the sand mold upon exposure to air. After successful testing of an alternative binder system, Hensley implemented low-HAP chemicals for airset mold making in April 2006, resulting in emission reductions of 7.7 tons per year. Further emission reductions have been achieved by reducing mold wash overspray, and continuing to investigate reduced VOC content in airset mold system chemicals. As a result of these pollution prevention and source reduction measures, the overall reduction in HAP potential to emit is estimated to be almost 15 tons per year. Hensley plans to further reduce its site wide HAP emissions in 2008 by investigating the use of low-HAP core chemicals and core catalysts.



Drum recycling has been accomplished by requiring suppliers of bulk chemicals to take back empty containers in good condition. This requirement is included in each vendor contract where possible. Returning empty containers to vendors reduces the number of empty drums that must be crushed for disposal as plant waste. As a result of a routine annual insurance audit, Hensley's safety and environmental committee also investigated alternatives to improve fire protection and spill containment for mold wash mixing and storage adjacent to the foundry pouring floors. As a result of this internal evaluation, Hensley switched from receiving bulk isopropanol in 55 gallon drums to using 300 gallon refillable steel totes. The change results in a savings of approximately \$2000 per year, and eliminate generation of used isopropyl alcohol drums.



After the cardboard and paper recycling program was successfully underway, Hensley increased the level of cardboard fiber recycling by separately collecting Gaylord sized "supersacks". Corn meal (used as a sand binder), certain types of shell mold sand, and ladle liner sand is received in these large square bags. In addition to the extra recycling revenue generated from reclaiming the supersacks, another waste material has been removed from the facility's compactor, further reducing the amount of landfilled plant trash.

To further enhance recycling revenue from scrap metals sent for off site reclamation, Hensley began collecting aluminum & copper separately. Although sources of these metals are relatively small in relation to other reclaimed scrap metal, the market value for these commodities makes it worthwhile for the facility to separately recycle them.



In the last quarter of 2007, Hensley began recycling printer and toner cartridges. This further reduces the amount of office waste in the trash compactor. Additionally, the facility implemented a pilot program to recycle certain types of plastics from shipping containers, packing materials, water and soda bottles, and shrink wrapping. The cost savings and rebates for these items will be tracked as line items in the facility's master recycling spreadsheet database.



Other projects started in 2007 include installation of pelletizers for electric arc furnace and sand plant baghouse dusts. Electric arc furnace dust is a listed hazardous waste. Pelletizing the furnace dust will allow Hensley to backcharge the furnaces with the material in a manner that does not cause nuisance dust, thereby reducing particulate emissions. The pelletized furnace dust is also a source of recoverable alloy metals. Separately pelletizing sand baghouse dust will improve the characteristics of the screened sand for beneficial reuse applications, and create another byproduct for separate potential beneficial reuse.

In each case, the decision to investigate additional recycling, reuse, source reduction, waste minimization, or further separation of recyclable commodities represents another level of commitment by Hensley Industries to actively incorporate pollution prevention and beneficial reuse into its business planning. To strengthen this commitment, in June 2007 Hensley applied to the Texas Commission on Environmental Quality (TCEQ) to become the first electric arc furnace secondary steel foundry facility enrolled in the Clean Texas program.

Hensley participated as a key sponsor and coordinator for the Keep Dallas Beautiful 2007 Trinity River Trash Bash, held September 15, 2007. The environmental manager contributed time and technical expertise on the event committee, and conducted the watershed reconnaissance for the Richards Branch Creek, which runs through the Hensley facility. In addition to securing financial and technical support for the event, the environmental manager put together a team of Hensley volunteers to participate on the day of the clean up...and played in the professional band hired by Keep Dallas Beautiful to provide entertainment for the volunteer luncheon! Throughout four adjacent watersheds covering approximately 2 square miles each, there were picked up 22,098 lbs of trash, 7,540 lbs of recyclable cans and bottles, and 20,000 lbs of tires.



Diana L Lundelius, CHMM, and the Hensley recycling team were presented Hensley's Presidential Award in April 2007. Hensley was selected by the Recycling Alliance of Texas as the winner of the 2007 Award for the Outstanding Integrated Solid Waste Program, and received 1st Place from the North Texas Corporate Recycling Association's 2007 Environmental Vision Awards in the category of "Business With Greater Than 100 Employees/Recycling".

