Starting & Sustaining The Foundry Byproduct Beneficial Reuse Program in Texas

Diana L Lundelius, CHMM
Hensley Industries Inc

North Texas Air & Waste Management Association
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Foundry Byproducts

Screened Foundry Sand

Furnace Slag

Carbide graphite electrodes

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Reclaimed Metal/Paper/Cardboard/Wood Waste
Target Materials

• Spent foundry sand
• Spent furnace slag
• Carbide graphite electrodes
• Ladle and furnace refractory
• Office paper/cardboard/supersacks
• Secondary – wood waste, plastic, e-waste, printer/toner cartridges
Advantages To Beneficial Reuse

- Disposal costs avoided
- Economic incentives to reduce overhead costs
- Cost effective material separation technologies available
- Secondary reclamation reduces raw material costs
- Reuse/recycle materials on site
- Improved operations efficiency
- Turn foundry sand into pay dirt – get $$$
Challenges, Obstacles, Pitfalls

- Employee and management attitudes
- Limited physical space available
- Limited capital funding
- Material separation/segregation/storage
- Breaking into end user markets
- Meeting end user requirements
- Transportation
- Waste regulations
Assemble Data & Set Milestones

- Identify markets/uses for byproduct materials
- Identify partners within reasonable distance
- Quantify material generation rates
- Determine material segregation & storage needed
- Conduct environ & materials testing
- Evaluate materials within waste regulations
- Transportation cost analysis
- Scheduling & logistics
- Decide how you will negotiate contracts
- Set target dates for implementation & stick to them
Successful Partnerships
Who Do You Talk To & How?

- Identify markets/end uses for byproduct materials
- Identify partners within reasonable distance
- Potential partners
  - concrete/aggregate – screening, crushing, stockpiling
  - roadbase/flowable fill product blenders
  - asphalt blenders – fines additives
  - concrete/brick/asphalt recyclers - secondary suppliers
  - cement kilns – furnace slag
- Identify end user requirements
- Guarantee your supply within a reasonable margin
Key Factors For Successful Logistic Planning

- Establish transportation cost factors
- Be selective in equipment investments
- Manpower – in house, temps, part time
- Consider wide range of equipment and manpower options – rent, lease/purchase, outsource, on site contractor
- Look at upstream process generation points for improved material separation
- Implement in phases
Key Factors For Successful Implementation

- Keep changes simple
- Educate employees about new expectations
- Involve & engage all depts for ideas
- Engage vendors & suppliers in recycling efforts
- Housekeeping
- Establish tracking mechanisms & accountability
- Realistic expectations
- Keep looking for other applications & end users
- Keep improving material separation & handling
Establish New Attitudes & Behaviors

- Gain consensus from *everyone*
- Look good on paper – show REAL savings
- Reinforce expectations about performance & accountability
- Show success with one program at a time
- Address learning curve issues immediately
- Be persistent
- Ask for ideas & alternatives when faced with criticism
- Perfection is not required for success
- Report results and refine goals

*Stop calling your spent reusable materials wastes. They are BYPRODUCTS.*
Elements of Beneficial Reuse Program
Spent Foundry Sand Solids & Slag

- Partnered w/ local concrete/aggregate company
- Turnkey on site screening/crushing, portable equipment
- Screen to < 1-1/2 inches (<1/2 inch for asphalt)
- Partnered with local rebase blender to make road base aggregate products
- Crush furnace slag, blend or use as crushed stone
- Strategically locate sand screening, stockpiling & transport
- Contract/temporary labor on as needed basis
- Improve upstream separation to remove metals, trash
- Protect stockpiles - consistent quality, prevent washout
- Aim for Class 3 status even if you can’t meet criteria now
Waste Characterization Testing to Meet TxDOT Prequalification (Texas)

- Must meet Class 2 non-hazardous criteria at minimum
- Class 3 (inert) highly desirable but not critical
- Class 3 testing
  - Total/TCLP metals, VOC, SVOC
  - Total petroleum hydrocarbon (TPH)
  - Total PCBs
  - Total pests/herbs – can eliminate based on process knowledge
  - 7-Day leachate for Table 3 constituents, metals, TDS
- TDS limit of 500 mg/L is very difficult to meet
- Air set sand and core materials contribute organics
- Get the metal out!!
Materials Testing to Meet TxDOT Prequalification (Texas)

- ASTM-D698A
- Solid Number/Max Dry Unit Weight pcf
- Optimum moisture content %
- Liquid limit
- Plastic limit
- Plasticity index
- % finer than No. 200 sieve
- Results expressed as moisture-density relationship nomograph
Acceptable/Unacceptable Applications For Spent Foundry Byproducts

Acceptable
• Road base
• Industrial foundation underlayment
• Inert concrete/aggregate products
• Asphalt fines additive
• Cement fines additive
• No direct potential exposure to people or animals

Not Acceptable
• Residential or commercial mulching
• Soil blending for landscape use
• Playgrounds
• Surface land application as clean fill
• Potential for direct exposure to people or animals
Elements of Reclamation Program
Carbide Graphite Electrodes

- Crush & reuse as carbon raiser
- Ask carbon suppliers about reclamation capabilities
- Crush & offer to concrete/aggregate users
- Identify reclaimers – where, how much, cost, transport
- Determine logistic requirements for collection, stockpiling, transport
- Conduct cost vs benefit evaluation for each option
- Select best recycling/reclamation option & implement

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Elements of Reclamation Program
Furnace & Ladle Refractory

- Refractory manufacturers crush and reclaim for manufacturing new product
- Sand must be separated cleanly from refractory
- Absolutely no metal
- Refractories may be combined
- Truckload quantities required
- Logistic planning needed for collection, stockpiling, loading, transport
- Cost break for closed loop reclamation with refractory supplier is ideal partnership
Elements of Recycling Program
Office Paper/Cardboard

- Quantify generation amounts
- Identify recycler willing to work with small generators
- Trailer pull frequency & weight requirements
- Select recycling containers and trailer size
- Identify what can/can’t be recycled
- Target locations for recycling containers – paper & cardboard must be kept dry
- Educate employees – NO TRASH
- Resourceful use of internal and contract manpower
- How about that confidential shredded paper?
Elements of Recycling Program
Wood Waste

- Quantify generation amounts and sources
- Identify wood waste mulching facilities - locations, tipping fees, container requirements
- Storage and transport – rolloff, trailer, closed box
- Engage trash service & wood pallet vendors
- Coordinate with wood pallet repair
- Determine need to break down pallets, crates, boxes
- Keep unacceptable materials out of wood waste
- Staging & housekeeping to manage stockpile
- Wood waste generating depts implement & monitor
- Use janitorial service or contract labor
Tracking Costs & Savings

• Track internal/external labor & equipment costs
• Include cost avoided for disposal and raw materials
• Track reduced plant trash hauls, compactor pulls
• Break out % of plant trash contents before recycling
• Track actual recycling costs
• Track recovered materials – BONUS!!!

Keep for raw materials value, track raw material shipments cancelled or postponed as cost avoided
• Keep tracking formulas realistic but simple – use a spreadsheet
Additional Recycling/Reclamation & Source Reduction Opportunities

- Construction debris reclamation
- Electronics and small battery recycling
- Printer/toner cartridge reclamation
- Reclaim spent core scrubber wastewater
- Replace drums w/ totes or portable tanks
- Recycle supersacks
- Pelletize EAF dust and sand baghouse dust
- Separate air set & green sand
- Separate aluminum & copper
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  general_services/recycling/default.htm
• EPA – Beneficial Reuse of Foundry Sand  
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  Sector Point-of-Contact, (202) 566-1407  
  http://www.epa.gov/sectors/metalcasting/foundry.html
• TCEQ - Foundries Compliance Resources  
  http://www.tceq.state.tx.us/assistance/sblga/foundry.html#tools  
  David Hudson, 325-698-6122