Turning Used Sand Into a Marketable Resource

Best Management Practices for Beneficial Reuse
Used foundry sand is a valuable resource that can be beneficially reused in many ways. If you are not currently reusing it and want to do so, this guide will help you start making changes in the way you view and manage your sand.

The key is to stop thinking of your used foundry sand as a waste and start thinking of it as a product. Look around your facility and at your used sand piles. Is the pile mixed with general plant refuse? Is it exposed to the elements or full of core butts? If so, your sand may not be marketable to a potential end-user. In addition, regulators may perceive that you are not handling the sand as a valuable resource.

This guide will provide you with information to help make your used foundry sand appealing for beneficial reuse and start a beneficial reuse program at your facility. It offers general sand management guidelines, information on potential end-users, tips for researching state rules and a check list for negotiations with end-users. Building an industrial recycling program can seem like a daunting effort, but this guide will break the project into manageable steps while providing the research tools you need to be savvy about the process.

**Is Sand Beneficial Reuse Viable for Your Facility?**

**Research potential end-users close to your facility**

In most cases, it is not economically viable to seek a beneficial reuse application hundreds of miles away as the transportation costs would be prohibitive. Utilize the links provided on page 4 to identify potential end-users. In addition, the American Foundry Society (AFS) can provide you with a map of potential end-users in close proximity to your facility.

**Know your product**

Calculate how much sand you generate on a monthly and yearly basis. Determine how much sand your facility can store and for how long. Perform the necessary tests [(TCLP) Toxicity Characteristic Leaching Procedure, sodium sulfate, grain size analysis, etc.] on representative samples of your sand and document the results for end-users.
Ask a lot of questions
Communication is especially important when starting your beneficial reuse project. Once you have identified several potential end-users, find out the following information:

- The end-user’s sand specifications and any physical requirements (color, etc.);
- The end-user’s volume and schedule requirements;
- Availability and cost of transportation;
- Your own costs to store, handle and load sand;
- Your current costs for sand handling and disposal;
- The end-user’s total cost for other possible materials.

During negotiations with a potential end-user, the following matters should be discussed:

- Monetary terms of the deal;
- Who will pay for any capital investments;
- Who will pay for transportation;
- Who will pay for any fees and routine lab work;
- Legal considerations;
- Insurance considerations.

Weigh start-up costs vs. long-term benefits
When you begin to market your sand, there are some start-up costs to consider, including state regulation compliance fees, sampling and analysis, processing costs, employee training and staff time. There also may be capital investments such as storage facilities or new equipment. It’s important to weigh any costs against long-term benefits you expect to receive. Keep in mind that beneficial reuse of foundry sand continues to become a more accepted practice as more end-users are introduced to the concept.

Conduct regular testing of your sand
End-users and regulatory agencies want to know that your sand has a consistent quality. The only way to demonstrate the consistency of your material is to periodically sample and analyze your sand and document the results of those tests. Make sure these tests conform to whatever standards are required by the state and end-users.

Talk to others
Look on the AFS (www.afsinc.org) and Foundry Industry Recycling Starts Today (FIRST) (www.foundryrecycling.org) websites to review recent case studies of successful reuse efforts. Contact these facilities to talk about their experiences and receive tips from colleagues in the industry.
Sand Consumer Requirements

**Asphalt**

Used foundry sand can be used as a partial replacement for the fine aggregate component in asphalt. While the specifications for the fine aggregate depend on the application, there are some general characteristics your used sand must meet to be of interest to an asphalt batch plant.

- Some used foundry sand containing clay, dust and/or metal fines cannot be used in an asphalt manufacturer’s mix design.
- Loss as measured in a sodium sulfate test should be less than 15%.
- The percentage of sand passing a 200 mesh sieve is limited. Some sands have a higher percentage passing a 200 mesh sieve. This requires that the used foundry sand either be screened or blended or that the amount of used sand in the mix is limited.

**Concrete**

Used foundry sand can replace a portion of the fine aggregate in a concrete mix. Concrete can be poured into forms in place, or pre-cast into concrete products such as bricks, pipes, blocks, and pavers.

As with asphalt, used foundry sand must be screened to grain size to be usable by a concrete batch plant. To meet concrete specifications, it is often necessary to remove fine material passing a mesh 200 sieve or blend used foundry sand with coarser sands.

**Portland Cement**

The Portland Cement industry has been beneficially reusing sand in its manufacturing process in recent years. It requires the following specifications for used foundry sand:

- 80% silica content;
- Low alkali levels;
- Uniform particle size;
- Fine material;
- Preferably in large quantities;
- Separated from other metalcasting byproducts;
- Core butts ground into uniform particle size.
Construction Applications

Used foundry sand has been used as construction material for decades. Most properly screened used foundry sands will satisfy the engineering requirements for embankment, structural fill, berms, roadway sub-base, and foundation sub-base. An emerging use for foundry sand is in constructing bioswales for storm water mitigation.

For more information on used foundry sand in construction applications, order the publication, “Foundry Sand Facts for Civil Engineers” through FIRST’s website.

Flowable Fill

Used foundry sand can be used as flowable fill which is usually a mixture of fly ash, cement and sand. Sand generally makes up a majority of the mixture. Flowable fill is used to backfill utility trenches, building excavations, underground storage tanks and abandoned mine shafts.

Horticultural Applications

A few companies have started employing used foundry sand as a component in manufactured topsoil, nursery soils, top dressing, mulch and compost. The dark colored sand/clay combination in green sands is of special interest to commercial soil blenders. This is a relatively new market and is being investigated by the industry and research institutions.

For More Information

asphalt: www.hotmix.org
cement: www.cement.org
flowable fill: www.flowablefill.org
construction applications: www.artba.org
How to Begin
Sand Beneficial Reuse

Confirm that your sand is non-hazardous according to the U.S. EPA

Sands from iron, steel and aluminum manufacturers are, in nearly all cases, non-hazardous. Sands from a leaded copper-base facility, however, may be considered hazardous for toxicity under EPA rules. In order to properly document that your used foundry sand is not considered a hazardous waste, you need to have a representative sample of sand tested using the TCLP (Toxicity Characteristic Leaching Procedure).

Research your state beneficial reuse policy

All states have solid waste programs that affect the beneficial reuse of foundry sand, and the requirements can vary greatly. Most state officials have shown an interest in promoting beneficial reuse, so stay positive and patient throughout the process. Become familiar with your state program, rules and requirements through:

• Your state’s environmental agency website.
• FIRST’s list of state reuse programs and policies at www.foundryrecycling.org/stateprofiles.
• EPA’s summary of guidelines and regulations at www.epa.gov/opispdwb/metalcasting/reusea.pdf.
• AFS’ website, www.afsinc.org, which is updated to contain case studies, links to end-user sites and technical information.

Keep trash out of your sand

Would you ever present your castings to a potential buyer in a container mixed with trash? Your workers should understand that the used foundry sand piles can no longer be considered a waste receptacle. The presence of physical contamination such as cigarette butts, coffee cups, soda bottles, floor sweepings, rags and other trash will increase the risk of fugitive dust potential and be unacceptable to most potential end-users. You can keep your sand free of foreign materials by:

• Placing trash containers where general refuse is first generated (i.e. lunch and break rooms) to ensure this refuse does not end up in the sand piles.
• Conducting routine inspections of the used sand piles and establishing a reward system for workers if no general refuse is present after a certain amount of time.

In general, used foundry sand destined for beneficial reuse also should be kept free of process materials including scrap metal, core butts and baghouse dust.

Protect your sand from the elements

Sand that is exposed to rain water or mixed with dirt and mud may not be attractive to end-users. In fact, one of the potential benefits of used foundry sand is its low moisture content. If you move the used foundry sand outside the facility, make sure it is in a designated area that minimizes exposure to run-on and run-off. One suggestion is to surround your sand pile with straw bales.
Quick Reference Guide
Beneficial Reuse Program Check List

Potential end-users close to my facility:

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Address</th>
<th>Primary Contact</th>
<th>E-Mail &amp; Phone</th>
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Sand Testing:

☐ TCLP Test  Date: ______  Results: ________________________________
☐ Sodium Sulfate Test  Date: ______  Results: ________________________________
☐ Sieve Analysis  Date: ______  Results: ________________________________
☐ Other  Date: ______  Results: ________________________________

Sand generation and storage:
1. ______ tons/month
2. ______ tons/year
3. ______ tons in storage

Questions to ask potential end-users:

<table>
<thead>
<tr>
<th>End-User</th>
<th>Sand Specifications (color, size, etc.)</th>
<th>Volume and Schedule Requirements</th>
<th>Availability of Transportation</th>
<th>Legal/Insurance Considerations</th>
<th>Who pays for... capital costs transportation, routine fees</th>
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Quick sand management review:

1) Determined as non-hazardous for toxicity by TCLP test?  ☐  Yes  ☐  No
2) In compliance with state regulations?  ☐  Yes  ☐  No
3) Trash in sand piles?  ☐  Yes  ☐  No
4) Sand protected from the elements?  ☐  Yes  ☐  No
5) Minimized sand exposure to run-on and run-off?  ☐  Yes  ☐  No