Foundry Sand: A Viable Aggregate Source for Construction

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Goal: To give further insight to the uses of foundry sand for construction purposes.

First objective: Identify the different types of foundry sand and some of their potential uses.
1) Green Sand

- Foundry sand mixed with bentonite (a type of clay) and Seacoal that once blended is used to make castings to pour melted metal into.

2) Resin Set Sands

- These are sands that chemically bonded to make cores to pour hot metal into.

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**Foundry Molding Sand**

- Foundry sand is made up of: Thermally reclaimed sand (from the cores on a future slide), bentonite, coal, and water.
- LOI 3.5, GFN 65, Moisture 3%, Approx. 35,000 tons/year generation from an average sized foundry.
- Used in asphalt, cement, flowable fill, agriculture, roadway beds and embankments.

**Core Butts**

- Phenolic urethane resin coated sand is used to make cores which form the internal dimensions of the castings.
- The type of sand used to produce these cores is a premium sand known as Oklahoma 90 – which looks like a marble under a microscope. It is mixed with sub-angular and sub-round sands to form a very dense core. This yields a very smooth casting surface.
- The remnants called “core butts” can be crushed to size for the asphalt industry.
**Green Sand Characteristics**

- A) Readily compacts because of the addition of bentonite.
- B) Has a high silica content.
- C) Has more than 5% passing the #200 screen on a washed gradation.
- D) Generally moisture content of 3%-5%
- E) 80% of all foundry sand is this type

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**Resin Set Sands Characteristics**

- A) Very high silica content
- B) Once it has been processed it will generally have a number less than 5% passing on the #200 sieve.
- C) This type of material is better for HMA.
- D) Low moisture content 0 – 2%
- E) 20% of all foundry sand is this type
- F) When used in asphalt density on roadway increases

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**Green Sand Reuse Applications**

- A) Cement production
- B) Flowable Fill
- C) Embankment and structural fill
- D) Manufactured soils
- E) Retaining wall backfill
- F) Roadway structural system (sub base)

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Green Sand ready to be transported to a cement plant.
**Flowable Fill (CLSM)**

**Foundry Sand Role in CLSM**

- Replace virgin fine aggregate in flowable fill with foundry sand
- Reduce the need for adding fines (fly ash)
- Additional water may be required when flowable fills contain foundry sand for hydration of bentonite
- Reduces need for more expensive cementitious fly ash
- EPA’s CPG requires use of RFS and/or Fly Ash in Federally-financed projects

**Structural Fills & Embankments**

**Ohio Turnpike Project 439901**

- Embankment required 58,000 tons of material
- Reinforced pavement supporting embankment
- Used MSE Retention system
- Contractor: Trumbull Corp./National Engineering
Ohio Turnpike Project 779901

- Embankment required 54,000 tons of granular backfill
- Third lane extension
- Reinforced Using a Pre-Cast Concrete Modular System
- Contractor: The Great Lakes Construction Co.

Manufactured Soils

State Highway Project

State Highway 60

K Street

GREDE FOUNDRIES, INC.
Performance Advantages in Sub Base or Embankment

- Not Susceptible to Freeze/Thaw
- Excellent compaction values
- Easy to use, handling not an issue
- Extremely uniform material, in contrast to conventional granular materials
- Relatively abundant and low cost
- Not moisture sensitive

Resin Set Sands Reuse Applications

- HMA (Asphalt)
- Ready Mix Concrete
- Flowable Fill

Air Set Foundry Sand
Core sand waiting to be transported to site to be crushed

Portable Crusher that can be used to crush sand and slag
APAC Atlantic/ Harrison Division

Crushed Core Sand

Average Gradation of Crushed Core Sand
Foundry Sand entering drum of Asphalt Plant
Blalock Construction Company

Concrete Production
- Non-conforming with specifications for concrete sand
- Lower strength for same cement content due to finer material
- Air void system is consistent with industry standards
- Good workability
- Can be combined with other materials that are recycled

Conclusions
- Foundry Sand is a viable alternative from traditional aggregate sources.
- Foundry Sand has performed in volumetric testing to be comparable to traditional aggregate sources.
- Some foundry sands out perform traditional aggregate sources in the mass production of asphalt by improving density and consistency of the volumetrics during testing.

Questions, Comments, Complaints