Beneficial Use of Foundry Sand

AFS Environmental, Health & Safety Conference
Nashville, Tennessee
August 23-25, 2010

John T. Kurtz, President
Kurtz Bros., Inc.
Locations

Cleveland
- Avon
- Garfield
- Valley View
- Willowick

Columbus
- Dublin
- Groveport
- Westerville
“Waste to Resource Experts!”

- Foundry Sand
- Construction Debris
- Biosolid Compost
- Anaerobic Digestion Systems
- Pallet/Wood Reclamation
- Yard Waste Recycling
Closing the Loop

Kurtz Bros., Inc.

"We make the good earth better!"

A CLEANER ENVIRONMENT!

Clean, Safe Products Used in the Landscape & Construction Industries

SOILS, MULCH, COMPOST, AGGREGATES

GREEN

- Wood, Pallets
- Leaves, Grass Clippings
- Biosolids Compost
- Other Reuseable Landscape Materials

GREY

- Reuseable Construction/Demolition Materials
- Foundry Sand
We are industry leaders in environmental work. Our successes in pioneering new technology and product development all focus on quality and integrity.

Members of the United States Green Building Council (USGBC) which sets (Leadership in Energy and Environmental Design) LEED Criteria

Honorary Mention
ARTBA Globe Award for Environmental Excellence for the ABRAMS CREEK-HOPKINS AIRPORT
U.S. EPA Is Focused On Recycling Resource Conservation Challenge

(1) Foundry Sand

(2) Construction & Demolition Materials (C&D)

(3) Coal Combustion Products
The U.S. EPA is focused on recycling.

Two of the focus materials for KB:
1) Construction & Demolition Debris
2) The Beneficial Reuse of Foundry Sands
Recycling Materials

Materials that can be used safely and effectively:

- Foundry Sand
- Biosolid Compost
- Crushed Concrete & Other Building Materials
- Yard Waste Mulch
- Clean Wood Mulch
Foundry Sand
How is Foundry Sand Used?

Waste... *What a waste!*

Waste is not waste if it is reused!
Metal foundries use large amounts of sand as part of the metal casting process

Foundries successfully recycle and reuse the sand many times in a foundry

Foundry sand can be used up to 100 times. When the sand can no longer be reused in the foundry, it is removed from the foundry and is termed “spent foundry sand”

Production is nearly 6 to 10 million tons annually

Like many waste products, foundry sand has beneficial applications to other industries

(Federal Highway Admin, 2004)
Recycling Foundry Sand

- Prior to beneficial reuse, this material was simply being dumped in landfills
- Kurtz Bros., Inc. has beneficially reused over 6,000,000 tons
Kurtz/Ford/Recycling Foundry Sand

- 1993 - Worked with the Ohio Cast Metals Association (OCMA) and the Ohio EPA resulting in development of OEPA Policy 400.007 in November 1994

- New policy allowed for greater flexibility in use, led to Kurtz Bros., Inc. being granted the first Permit to Install (PTI) for unrestricted topsoil blends utilizing Ford Cleveland Casting Plant’s Spent Foundry Sand (SFS)
Recycling Materials – Facts About Foundry Sand

- High quality silica sand
- Meets or exceeds drinking water standards for the State of Ohio – Cleaner than typical Ohio Farmland soil
- Meets 203.03 N ODOT Specification
- Accepted as the fine aggregate component of many ODOT specifications
- Can be used as or in:
  - Flowable Fill
  - Structural Fill and Embankment
  - Soil Blending including Bio-Retention media, Rooftop media and Landscape media
  - Asphalt and Concrete
  - Road Base
Kurtz Bros., Inc. has been an active advocate of the beneficial use of foundry sand and has contributed to efforts to inform public and private entities regarding the possibilities of its safe, effective use.
Foundry Sand Fact Sheet

Interim Research Results Show Foundry Sand Safe for Reuse – July 2010

www.foundryrecycling.org
Foundry Sand Soil Classification

- Foundry sand would normally be classified under the Unified Soil Classification System (USCS) as SP, SM or SPSM
- And under AASHTO as A-3, A-2, or A-2-4
- It is a non-plastic or low plasticity sand with little or no fines
- The silt or clay content can range from 0 to 12% (Federal Highway Admin, 2004)
  - Typical for KB sands is 2 – 3%
Structural Engineered Fills

• Keeps Options Open
• Safe
• Saves Natural Resources – Sustainability
• Excellent Engineering Properties
• Readily available from a qualified processor or a foundry with good housekeeping
• Nothing New – It’s Just Sand
• It Works!
What took thousands of years to produce by mother nature is destroyed by bulldozing and stockpiling of natural topsoil.

To begin rebuilding that soil structure, amendments must be added to create a sandy loam texture. Recycled Foundry Sand is particularly well-suited as the sand component.
Horticultural Applications

Blended with foundry sand, biosolids compost, rice hulls, pine bark and natural soil, Kurtz Bros. Container Mix has become the preferred soil blend for Ohio nurseries.
Foundry sand is an essential ingredient in Kurtz Bros. Bed Mix to create a well-drained sandy loam growing medium for more successful landscape projects.
Commercial Applications

Foundry sand in the mix creates the economic advantage needed to provide quality soil to large projects.

Euclid Corridor, Cleveland, OH 2008 – 7,000 yards planting mix

Cleveland Clinic, Cleveland, OH 2008 – 20,000 yards topsoil

Cleveland Art Museum, Cleveland, OH 2007/8 – 12,000 yards topsoil
Rooftop gardens are proven to save heating and cooling energy and costs, remediate storm water, and create better environments for building occupants.

Sandy loam soil with foundry sand in the mix helps create an ideal, light weight blend when combined with Haydite expanded shale aggregate.
Clean Water Act

- Developed as a guide for states to improve water quality from storm water run-off
- Mandatory regulations for developers to handle ALL storm water on site
Raingardens
Raingardens/Bio-Retention
Seven Hills Bioswale BEFORE
PLANTING Seven Hills Raingarden
Raingardens/Bio-Retention

Seven Hills Raingarden AFTER 1 Year
Bio-Retention

- Provides water remediation at the source point
- Typically specified for draining areas of 2 acres or less
- Used where land uses include highly impervious areas like parking lots, roadways, cul-de-sacs and parking islands
Bio-Retention in Theory
Bio-Retention in Practice

- Bio-Retention Soil
- Mulch Layer
- Grass Buffer
- Overflow
- Plant Material
Dynamic Compaction at Embassy Suites
Abrams Creek Improvement Project
Cleveland Hopkins Airport

- Diversion and Enclosure of Abrams Creek
- 20,000 cu. yds. of Flowable Fill Required as Pipe Bedding Around (4) 10’ Diameter Pipes
- Conventional Fill would not have worked due to Pipe Placement and Project Design
Liberty Way Project

Cover of Modern Casting Magazine
What Kind Of Foundry Sand?

- Green Sand
- AFS 50-53 Lake Sand
- Sand From Iron Foundry
- Had Moisture Content of 4%-6% as Stockpiled
- Free from Debris after Processing
- No Sharps, No Contamination
Why Use Spent Sand?

- Good Fit For Application
- Approved For Use Under OEPA DSW Policy 400.007
- Smaller Similar Projects Have Worked Well
- Competitive Pricing Advantage
Required Embankment

- Reinforced Pavement Supporting Embankment
- Reinforced Using a Pre-Cast Concrete Modular Wall System Provided by the Reinforced Earth Company
- This System Develops a Coherent Gravity Mass Which is Engineered to Resist Applied Loads
- The system uses a series of Pre-Cast Modular Wall Pieces in Conjunction with Galvanized Steel Reinforcing Strips Which are Layered into the Select Granular Sub-base Backfill
Why Use Spent Sand for Sub Base or Embankment?

- Not Susceptible to Freeze/Thaw
- Excellent Compaction Properties
- Easy to Use, Handling Not an Issue
- Extremely Uniform Material
- Relatively Abundant and Low Cost
- Not Moisture Sensitive, Less than Clay
Great Lakes Construction
I-271 Slide Repair – ODOT #801102

- 10,000 Tons of Spent Foundry Sand
- Excellent Drainage
- Excellent Compaction
- Layered Composite
Embankment that Blends with Nature

Stepped Embankment
(Ohio Turnpike, sand supplied by Kurtz Bros., Inc.,
construction by Trumbull Corp.)
Tests Required for Your Marketing Arsenal

- CBR Value
- Corrosivity
- pH
- Analytical – Must meet OEPA DSW Policy 400.007 parameters, which are based upon drinking water standards
- Friction Angle
- Sieve Analysis
- Standard Proctor
- Conductivity
- Sodium Sulfate Soundness
## Select Granular Backfill Requirements

- **Sieve Requirements:**

<table>
<thead>
<tr>
<th>Sieve</th>
<th>OTC % Pass</th>
<th>R-Earth % Pass</th>
<th>Ford % Pass</th>
<th>Size</th>
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<tr>
<td>4”</td>
<td>-</td>
<td>100</td>
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<td>3”</td>
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<td>75-100</td>
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<td>3/4”</td>
<td>100</td>
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<td>100</td>
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<td>3/8”</td>
<td>80-100</td>
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<td>No. 50</td>
<td>7-45****</td>
<td>*****</td>
<td>53******</td>
<td>49</td>
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<td>No. 200</td>
<td>0-7</td>
<td>0-15</td>
<td>3.6</td>
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## Select Granular Backfill Requirements

<table>
<thead>
<tr>
<th>Property</th>
<th>Specification</th>
<th>Results</th>
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<tr>
<td>Soundness</td>
<td>15% Max Loss</td>
<td>3%</td>
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<tr>
<td>Liquid Limit</td>
<td>25% Max</td>
<td>N/A</td>
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<tr>
<td>Plastic</td>
<td>6% Max</td>
<td>Non Plastic</td>
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<tr>
<td>Proctor</td>
<td>&gt;=120 pcf</td>
<td>122 pcf</td>
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<tr>
<td>Friction Angle</td>
<td>&gt;=34 degrees</td>
<td>35 degrees</td>
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<tr>
<td>Resistivity</td>
<td>&gt;=3000 ohm-cm</td>
<td>5,600 ohm-cm</td>
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<tr>
<td>pH</td>
<td>5-10</td>
<td>9.2</td>
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<tr>
<td>Sulfates</td>
<td>&lt;200 ppm</td>
<td>87.6 ppm</td>
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<tr>
<td>Chloride Levels</td>
<td>&lt;100 ppm</td>
<td>35 ppm</td>
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The Hurdles

- Although Used, Not Used Commonly
- Fears
  - New
  - Dirty?
  - Liability
- Many Misconceptions
- Competition
- Beneficial Use Policy Issues
- Conflicting Requirements
Significant Marketing Plan

- Enlist the Experts Where Needed
- Network with Project Owner, Architect, Engineer, and Material Manufacturer
- Big PR Positive for the Governor (R’s – not always viewed as green)
  - Also Positive For Industry
  - Promote Innovation
Geotech Consultant Invaluable

- Credible
- Independent
- Experienced with Spent Sand
- Talks their Language
- Nothing to Gain, Nothing to Lose
# Notable Foundry Sand Projects

<table>
<thead>
<tr>
<th>Project/Location</th>
<th>Quantity</th>
<th>Project Number</th>
<th>Owner</th>
<th>Contractor</th>
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<tbody>
<tr>
<td><strong>MSE Wall Projects</strong></td>
<td></td>
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<tr>
<td>Ohio Turnpike Third Lane Project 779901</td>
<td>54,000 tons</td>
<td>779901</td>
<td>Ohio Turnpike Commission</td>
<td>Great Lakes Construction</td>
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<tr>
<td>Schaaf Road Bridge Replacement</td>
<td>27,000 tons</td>
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<td>Cuyahoga County</td>
<td>Great Lakes Construction</td>
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<tr>
<td>I-271 &amp; Route 303 IR Bridge Replacement</td>
<td>21,272 tons</td>
<td>050316</td>
<td>ODOT</td>
<td>Kokosing</td>
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<td>Fulton Road Bridge Replacement</td>
<td>12,600 tons</td>
<td>060372</td>
<td>ODOT</td>
<td>Kokosing</td>
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<tr>
<td>I- 71 &amp; Route 83</td>
<td>7,600 tons</td>
<td>050048</td>
<td>ODOT</td>
<td>Kokosing</td>
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<td><strong>ODOT Projects</strong></td>
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<tr>
<td>I-271 Slide</td>
<td>10,000 tons</td>
<td>8011(02)</td>
<td>ODOT</td>
<td>Great Lakes Construction</td>
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<td>I-271 Express Lanes</td>
<td>5,000 tons</td>
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<td>ODOT</td>
<td>Independence Excavating</td>
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<tr>
<td>Route 82 &amp; Route 8 ODOT Subbase – Macedonia</td>
<td>500 tons</td>
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<td>ODOT</td>
<td>Independence Excavating</td>
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<td>SR 237 Front St. Railroad Grade Separation – Berea</td>
<td>86,000 tons</td>
<td>080598</td>
<td>ODOT</td>
<td>Great Lakes Construction</td>
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<tr>
<td><strong>Public Projects - Embankments</strong></td>
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<tr>
<td>Ohio Turnpike Third Lane Project 439901</td>
<td>58,000 tons</td>
<td>439901</td>
<td>Ohio Turnpike Commission</td>
<td>Trumbull Corp/National Engineering</td>
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<tr>
<td>Ohio Turnpike Great Lakes Service Plazas</td>
<td>50,000 tons</td>
<td></td>
<td>Ohio Turnpike Commission</td>
<td>Independence Excavating</td>
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<td>Patriot’s Way</td>
<td>25,000 tons</td>
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<td>Independence City</td>
<td>Independence Excavating</td>
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<td><strong>Public Projects – Flowable Fill</strong></td>
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<td>Abrams Creek Diversion</td>
<td>20,000 tons</td>
<td></td>
<td>FAA</td>
<td>Independence Excavating</td>
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<tr>
<td>Cleveland Hopkins Airport</td>
<td></td>
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<tr>
<td><strong>Private Projects – Embankments</strong></td>
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<tr>
<td>Cloverleaf</td>
<td>600,000 tons</td>
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<td>Valley View/Independence</td>
<td>Kurtz Bros., Inc.</td>
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<tr>
<td>West Creek</td>
<td>500,000 tons</td>
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<td>Independence</td>
<td>Independence Excavating</td>
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<tr>
<td>Rockside Road</td>
<td>500,000 tons</td>
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<td>Valley View</td>
<td>Kurtz Bros., Inc.</td>
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<tr>
<td>Footes/Cinemark Theatre</td>
<td>250,000 tons</td>
<td></td>
<td>Valley View</td>
<td>Kurtz Bros., Inc.</td>
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<tr>
<td>Vale</td>
<td>160,000 tons</td>
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<td>Kurtz Bros., Inc.</td>
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<td>Majewski</td>
<td>96,000 tons</td>
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<td>PLPI Heinton Road</td>
<td>48,000 tons</td>
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<td>Kurtz Bros., Inc.</td>
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<td>CDF Area I – Final Grade</td>
<td>25,000 tons</td>
<td></td>
<td>Cuyahoga Heights</td>
<td>Kurtz Bros., Inc.</td>
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<tr>
<td>Embassy Suites</td>
<td>20,000 tons</td>
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<td>Independence</td>
<td>Independence Excavating</td>
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<tr>
<td>City of Aurora Sewer</td>
<td>20,000 tons</td>
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<td>Aurora</td>
<td>Kurtz Bros., Inc.</td>
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<td>Towpath I/Towpath II</td>
<td>15,000 tons</td>
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<td>Kurtz Bros., Inc.</td>
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<td>Richfield Retail Development</td>
<td>10,000 tons</td>
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<td>Valley View</td>
<td>Kurtz Bros., Inc.</td>
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<tr>
<td>Delta – York Drive</td>
<td>10,000 tons</td>
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<td>Richfield</td>
<td>Kurtz Bros., Inc.</td>
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<td><strong>Leachate Collection Systems</strong></td>
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<tr>
<td>Rosby Hill</td>
<td>12,000 tons</td>
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<td>Brooklyn Heights</td>
<td>Kurtz Bros., Inc.</td>
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<tr>
<td>Waste Management Leachate Collection</td>
<td>10,000 tons</td>
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<td>Glenwillow</td>
<td>Waste Management</td>
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</table>
Conclusion

- Economical “Save the Tax Payers Money”
- Safe – Wave the Green Flag
- Excellent Engineering Properties
- Readily Available
- It Works!!!
Affiliated Companies

- Harmony Real Estate Co.
- Brookside Sand & Gravel
- Kurtz Bros., Inc.
- Amerimulch
Thank You!