Taking WTE Ash Recycling to the Next Level in the U.S.

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Presentation Overview

- Inashco and Eco- Recovery Solution (ERS) background
- Overview of the Technology and Process
- The Recovered Products
- Future Mineral Reuse
- Project Examples
- Conclusions
In the US with a Strong Foundation

- Waterland: Private equity, $4 billion AUM
- Fondel: trading company, approx. $1.5 billion
- Delft University of Technology: IP provider
- Inashco BV: Netherlands, 2008, parent, $130 million turnover, ~250 FTE
- Ballast Phoenix: Ash Recycling, 80% UK, 20 yrs, 10 sites, $26m turnover, ~82 FTE
- Boskalis: 1910, $3.5 billion, ~14,000 FTE, Cooperation Agreement
- Inashco North America: 4 yrs, subsidiary company, ~20 FTE, 1 Facility in VA and 1 facility in permitting/design in PA
- Wheelabrator, 40 yrs, 16 EfW, 4 IPP, 4 ash mono-fills, 3 transfer, 1200 FTE
- ERS: 50/50 WTI JV, 2+ yr, 20 FTE, 2 ADR-projects, 1 Central Upgrading Facility under design and permitting
2015: 5+ million tons of ash processed
"Inashco recovers metals from Waste-To-Energy combined ash and prepares the minerals for future re-use"
Ballistic concentration explained (ADR)

ADR & ECS are complementary technologies

Input 0-12 mm
Combined Ash

Mineral fine/moist 0-2 mm
ADR Concentrate to ECS
Minerals
NF

= Larger minerals
= High moisture sticky fine minerals
= Larger non-ferrous metals
= Fine non-ferrous metals
= Embedded NF in clogged minerals
= Eddy Current Separator

Accelleration
Separation on weight and shape
Focus on the Fine Fraction

Traditional ash treatment

Inashco Technology

Size (mm)

R&D efforts
Recovered Products

**Fine minerals**
(0 – 2 mm)

**Mineral aggregates**
(2 - 50 mm)

**Non-ferrous concentrate**
(1 - 12 mm and 12 - 50 mm)

**Ferrous concentrate**
(12 – 50 mm)
Non-ferrous products

Aluminum scrap product (middle)
- 4 – 8 mm
- 75 - 80 % pure metal scrap

Heavy non-ferrous scrap
- 1 – 12 mm
- 95-99 % pure metal scrap
The value chain goal

Waste-to-Energy

Ash Upgrading

Road Construction

Fe and NF Metals

Continuous Technology Development

Cu/Zn Scrap
Al Scrap
Concrete Products
Cement

INASHCO

INASHCO
Re-using the ash minerals
Central Upgrading Facility
Sluiskil, the Netherlands

ADR Installation at AEB Amsterdam
Central Upgrading Facility #1
Sluiskil, the Netherlands
Central Upgrading Facility #2
Maastricht, the Netherlands
Central Upgrading Facility
Sluiskil, the Netherlands
ADR plant Putnam, Connecticut
ADR plant Shrewsbury, Massachusetts
Lancaster County Solid Waste Authority
165,000 TPY Facility
The end game

Circular economy

- Raw materials
- Design
- Production
- Remanufacturing
- Distribution
- Consumption
  - use, reuse, repair
- Collection
- Recycling
- Power
- Minerals
- Metal
- Residual waste

R&D
• **Ash recycling** is finally coming
• Commercially **proven technologies** are now recovering the more valuable fine non-ferrous metals
• **Down-stream processing** is also recovering additional ferrous and coarse non-ferrous metals not recovered at the plants
• As metal commodity prices recover, metals recovery from ash will **improve WTE project economics**
• **Ash “aggregate” re-use** will be allowed in some cases in the US

*Don’t waste your ash!*
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