

Day Group

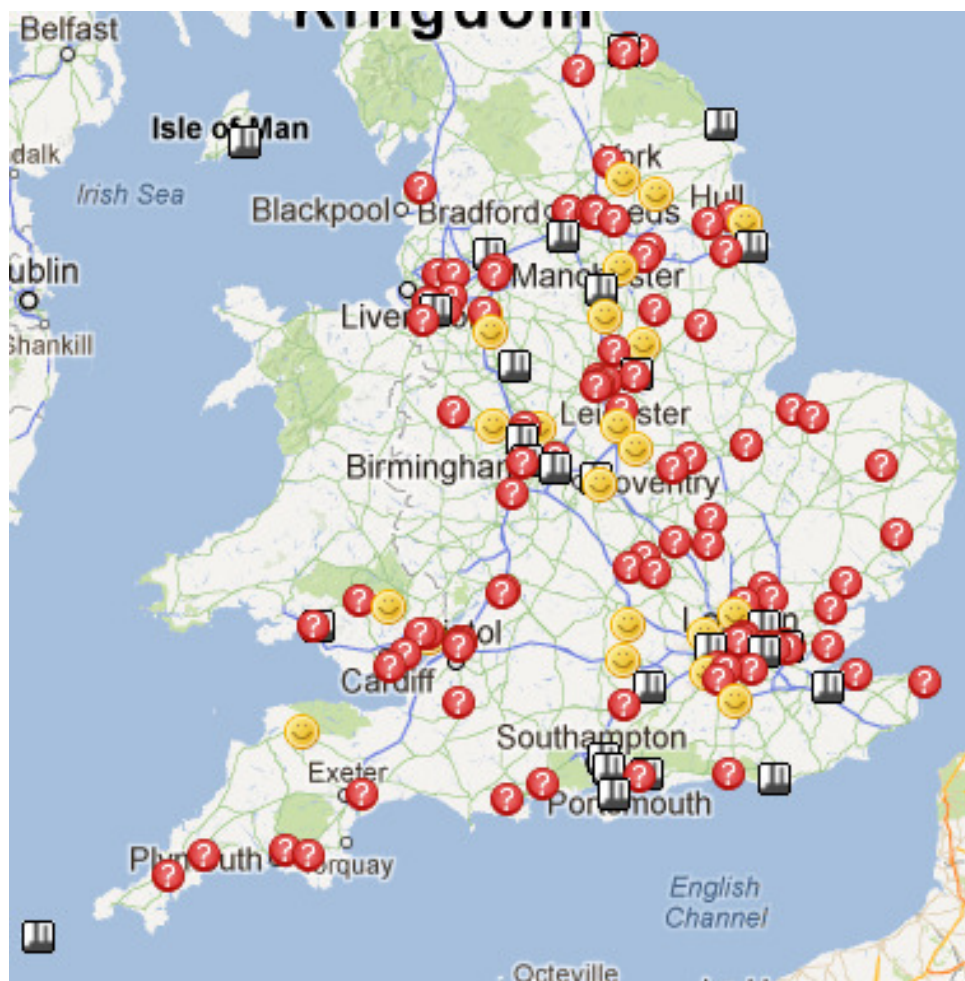


Advances in the Processing and Use of Incinerator Bottom Ash

- UK availability
- Overview of IBA
- The treatment of IBA to separate metals to create an aggregate (IBAA)
- IBAA properties
- Standards and specifications for IBAA in Concrete



Existing and Planned IBA sites



Source – UK without incineration

Existing and Planned IBA sites

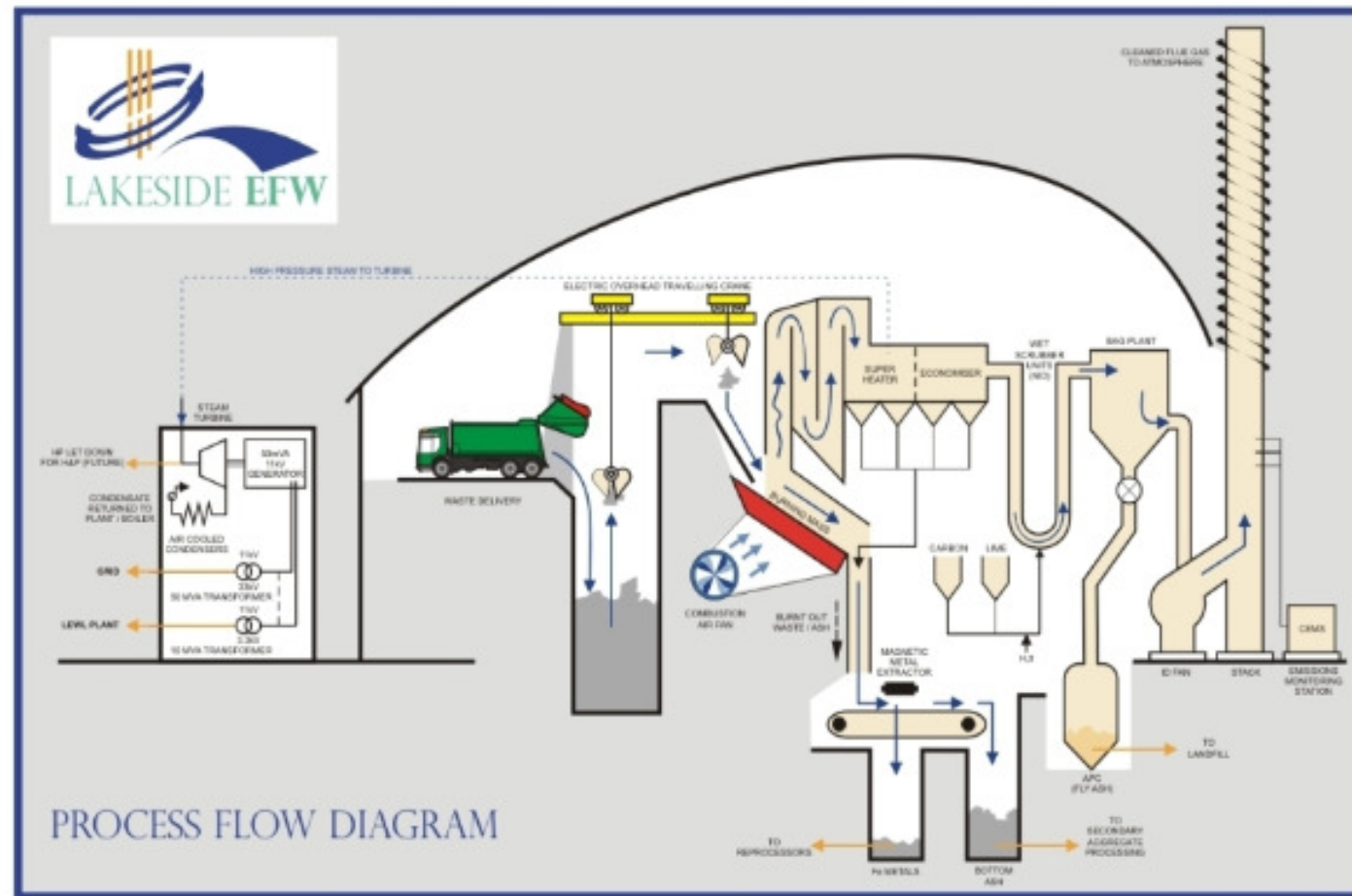
- The UK currently recovers approximately 1.1 million tonnes per year of IBAA from energy from waste facilities (EfW's).
- This is predicted to increase to some **2.4 million tonnes by 2020** as new facilities linked to long term waste disposal contracts come on stream.
- This presents a constant supply of consistent quality IBAA to aggregate users.
- EfW's can be found where there is not normally a regular supply of recycled aggregates

An energy from waste plant



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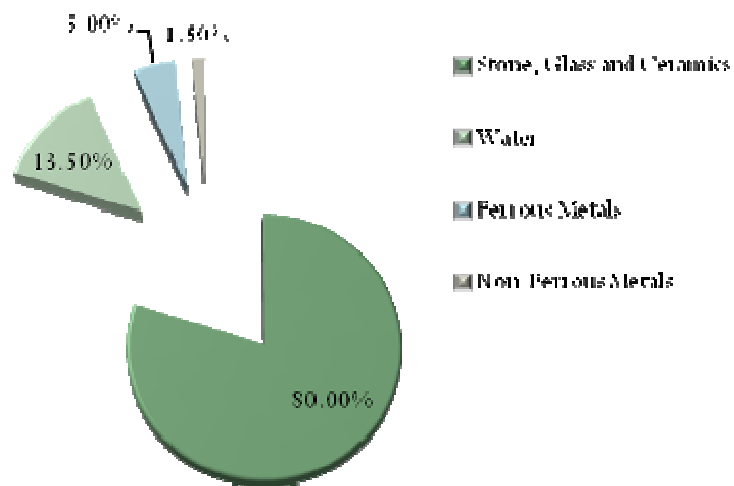
The workings of energy from waste plant



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Properties of IBA

It is a heterogeneous material that may contain varying proportions of glass, ceramics, brick and concrete in addition to clinker and ash



Overview of processing plant

- Raw IBA after 3 weeks storage (maturation period)



Overview of processing plant

- The site at Brentford



Overview of processing plant

- Non ferrous magnet



Overview of processing plant

- Ferrous removal



Overview of processing plant

- NF after eddy separators



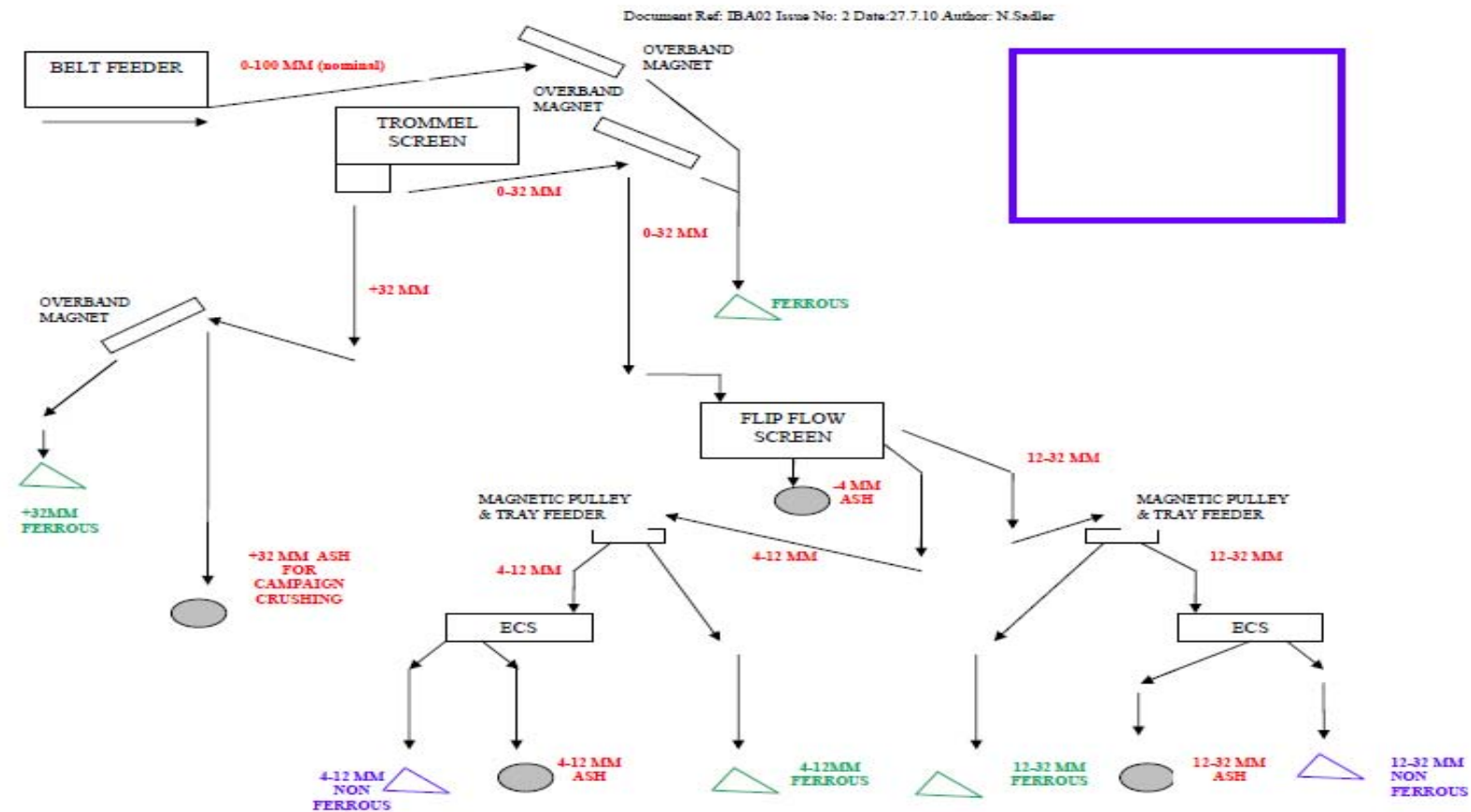
Overview of processing plant

- 0/4mm de-metaled



Overview of processing plant

- The process flow



Overview of processing plant

- 0/4mm de-metaled



Current Uses of IBAA

- **Backfill to Structures**
- **Capping**
- **Sub-Base**
- **Aggregate replacement in Hydraulically Bound Mixtures**
- **Aggregate replacement in Asphalt**

HBM – typically 5%-8% PC content

- Products are made to EN 14227 standards and generally we look to use recycled aggregates as the base aggregates where possible.
- The binders we use are OPC, lime and conditioned PFA is also used.
- Material stability is demonstrated by immersed strength tests



WRAP Website – a useful guide to using IBAA

The screenshot displays the WRAP website interface. At the top left is the WRAP logo with the tagline "Working together for a world without waste". To the right is a search bar labeled "SEARCH" with a "Enter keywords" placeholder and a search icon. Below the search bar are links for "AggRegain" and "All WRAP". A navigation menu on the left lists various topics: Geosystems, Opportunities, Specifier, Supplier Directory, Case Studies, Planning, Recycling Infrastructure, Quality, Waste Management Regulations, Demolition, Procurement, Sustainability, and Utilities. The main content area features the "AggRegain" title and several promotional tiles: "Welcome to AggRegain.." (Your complete online guide to sustainable aggregates...), "Sustainable Aggregates" (What are they and why use them...?), "Opportunities" (Find out where recycled and secondary aggregates can be used...), "Zero Waste Scotland Recycled Aggregates Directory" (Find producers in Scotland that comply with the Quality Protocol...), "CO₂ Emissions Estimator Tool" (Find out more and download the tool...), "REACH Aggregates Pre-registration Information", "Materials Resource Efficiency in Regeneration Projects", and "recycled roads" (Find out more...). At the bottom, contact information is provided: Helpline 0800 100 2040 and Office 01295 819900. The footer includes copyright information (© WRAP 2010), links to Privacy policy and Terms & conditions, and a "Sign up for E-newsletter" button with a "Contact WRAP" link.

wrap Working together for a world without waste

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AggRegain

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Your complete online guide to sustainable aggregates ...

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the quality protocol
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Potential Use in Concrete Products - EN 12620



Aggregates for Concrete

- **BS EN 12620 will give a classification code of B1**
 - IBAA has history of use
 - There are no Special requirements in the standard
 - Additional requirements identified for inclusion

Potential Use in Concrete Products - major concerns

- **Al and Zn content**
 - **BS EN 1744-8:2012**
Tests for chemical properties of aggregates. Sorting test to determine metal content of Municipal Incinerator Bottom Ash (MIBA) Aggregates
- **Alkali Content**
- **Chlorides**
- **ASR**

Products specification/EU Declaration of Conformity		8 June 2012
AEC-Granulate 0-10mm as coarse aggregate for concrete in accordance with NEN-EN 12620 and CUR recommendation 116		
 Production location: Heros Sluiskil B.V. Oostkade 5 4541 HH SLUISKIL (NL) Telephone: 0115-471258 Fax: 0115-472775 E-mail address: info@heros.nl		
article	subject	specification
4.2	Aggregate size	0/10
4.3	Grading	All-in GA90 see also appendix
4.4	Shape of coarse aggregate	
	- Flakiness index	$F_{1.5}$
	- Shape index	$S_{1.5}$
4.5	Shell content of coarse aggregate	SC_{AR}
4.6	Fines content	f_f
4.7	Fines quality	B- not harmful
	Methylene blue value 0/2 mm MBT	0.1 g/kg
5.2	- resistance to fragmentation	NPD
	- resistance to impact	SZ_{AR}
5.3	Resistance to wear	$M_{DE} NR$
5.4.1	Resistance to polishing	PSV_{AR}
5.4.2	Resistance to surface abrasion	AAV_{AR}
5.4.3	Resistance to abrasion from studded tyres	$A_{AR} NR$
5.5	- Particle density (0-10mm)	2,133 Mg/m ³
	- Water absorption 24 hours	$WA_{24} 9.5 - 10 \%$
5.6	Bulk density (loosely poured)	1,074 Mg/m ³
5.7.1	Freeze/thaw resistance	F_{NR} / MS_{NR}
5.7.2	Volume stability - drying shrinkage	0,041 %
5.7.3	Alkali-silica reactivity	Potential ASR-reactive
6.2	Chlorides	< 0.4 % m/m
6.3.1	Acid-soluble sulphate (SO ₃)	$AS_{1.3}$
6.3.2	Total Sulphur	$S_1 (0.45\% \text{ m/m})$
6.4.1	Constituents that alter the rate of setting and hardening of concrete	A_{10}
Other information		
AEC granulate is AVI ash that is made suitable for application as an additive for concrete by means of additional processing. This additional processing consists of sieving and separating ferrous and non-ferrous components.		
Emission of anorganic components	Meets the requirements in appendix A, table 1 of the Soil Quality Regulation for IBC building materials.	
Composition organic components	Meets the requirements in appendix A, table 2 of the Soil Quality Regulation	
Eural:	Non Hazardous Waste - Eural code 19 01 12	
	Alkali content (Na ₂ O-eq)	0.4 - 0.6
	Metallic Al + Zn content	≤ 1 % m/m
	Loss due to burning	≤ 3%
Due to the increased alkali content of the coarse aggregate it must be ensured that the alkali content of the eventual concrete mixture meets the requirements as stipulated in CUR recommendation 89.		
Due to the increased value of Sulphate dissolvable in acid, the manufacturer of the concrete mixture to which the coarse aggregate is added must select a sulphate resistant cement.		
EU Declaration of Conformity		
On behalf of Heros Sluiskil B.V. in Sluiskil, the undersigned declares that the AEC granulate specified in this product specification sheet from the refinement installation at Oostkade 5 in Sluiskil meets the requirements of Annex ZA of NEN-EN 12620 on the grounds of the Building Products Directive (89/106/EU) if it is applied in accordance with the application conditions stated on the product specification sheet.		

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Conclusions

- IBAA is already recognised as unbound aggregate in the UK
- Improved processing machinery results in less NF content in the fine fraction IBAA
- EN Standards now set test methods and declaration levels to enable a specification to be agreed between the supply and user
- The commercial benefit of using IBAA should justify the costs associated with approving it as aggregate replacement in concrete products