

Doing more with our ASH



29th January 2018
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Introduction to Meldgaard

- ✓ Recycled ASH from Waste-t-Energy plants since the 1980's with 85% market capture in Denmark for ASH recycling.
- ✓ To date globally processed **>12,000,000** tonnes ASH
- ✓ All of the ASH processed in Europe has been for construction purposes



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Meldgaard in the US

US operations in FL, MD and VA since 2013

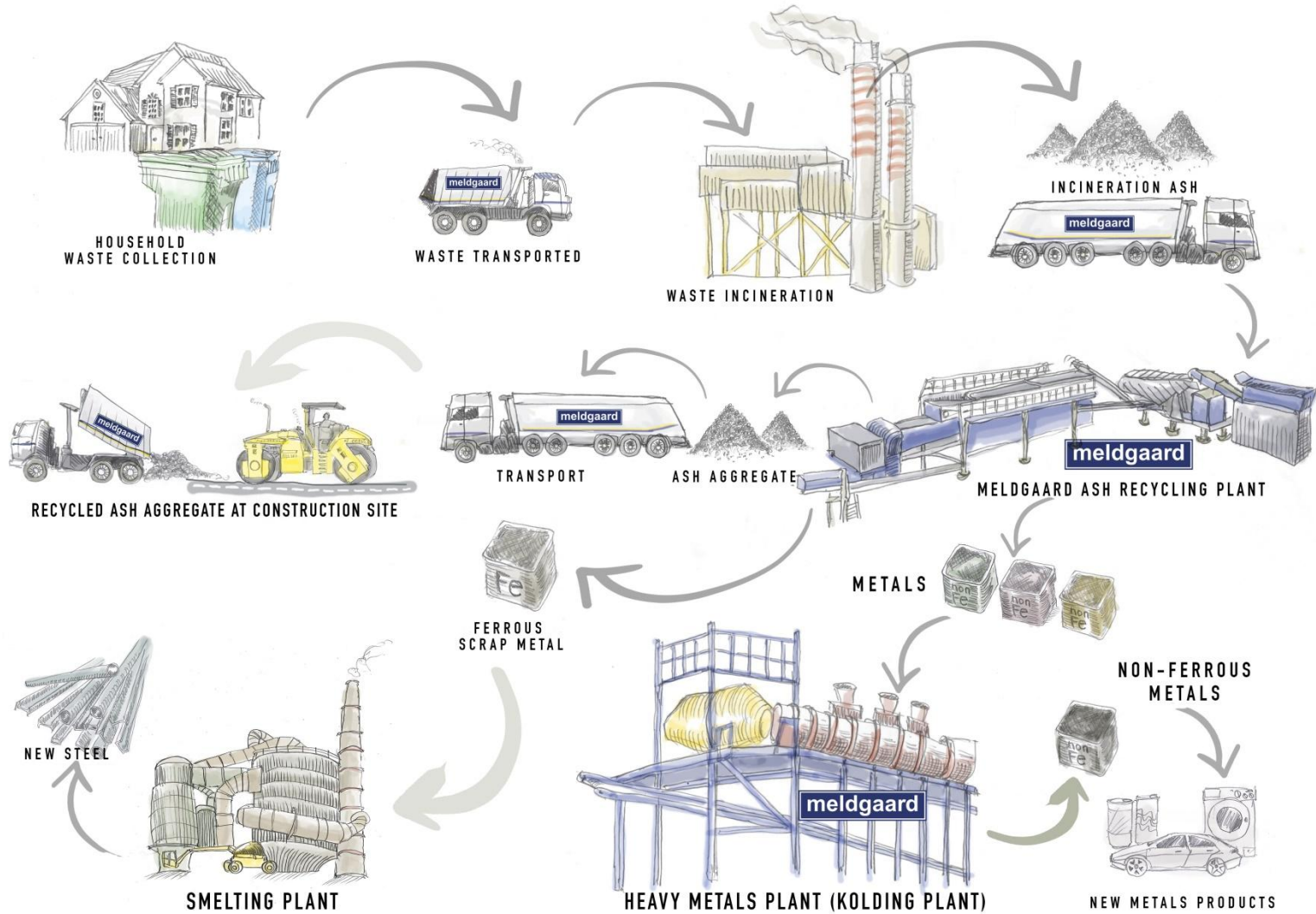
- On site operation at RDF plant with mixed ash (190,000 Stons/year)
- On site operation for bottom ash directly out of boilers (120,000 Stons/year)
- Monofill operation with mixed ash (200,000 Stons/year)
- Landfill operation with mixed ash (210,000 Stons)



Total of 2,000t per day in the US



Circular Economy for ASH



ASH in Florida

Approximately **1.5 million tons** of ASH per year.....



- Majority going to landfill
- High disposal costs
- Lost opportunities for a recycled material
- Lost opportunity for a revenue stream

Sorting and Recycling



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Non Ferrous Separation



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Clean Ash Aggregate



Ash Aggregate



Ash aggregate for road construction

Ash aggregate for hard standing



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Ash Aggregate



Ash aggregate for road construction



Ash aggregate for embankments



Ash Aggregate



Ash aggregate for hard standing

Ash Mining



Ash mining 120,000t for metals extraction & ash aggregate

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Ash Mining



Ash mining 120,000t for metals extraction & ash aggregate

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Hillsborough Research Project

Hillsborough County proactive approach for Ash recycling:

- Researching beneficial use of incinerator combined ash for road base aggregate in lieu of land filling - material will be used in construction of new road
- Meldgaard recycling 30,000 tons of incinerator ash from the waste-to-energy plant at Hillsborough County Resource Recovery Facility



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Hillsborough Research Project

Hillsborough County proactive approach for Ash recycling:

- Extraction of metals and screening to a range of sizes so that the ash aggregate can be beneficially used as a road base for a county project
- Commence and complete in 2018 with Meldgaard mobile ash recycling solution
- Long term benefits of approximately 75% reduction of Ash going to landfill



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Hillsborough Research Project

Hillsborough County proactive approach for Ash recycling:

- University of Florida materials laboratory will be testing the ash materials for different uses



Screened sizes:

$< \frac{1}{4}$ " (0-6mm) ash

$\frac{1}{4}$ " – $1\frac{1}{2}$ " ash (6-40mm)

$\frac{1}{4}$ " – $\frac{3}{4}$ " ash (6-20mm)



Challenges to recycling ASH

Key challenges:

- Combined ASH vs Bottom ASH
- Quality combustion at WtE plant to provide a clean ash aggregate
- Enabling maturation period of the ash before processing/recycling to maximise metals removal
- Ensuring location of application is low risk
- Providing confidence to the engineers that it works...and they can get insurance & sign off



Deklaration for genbrug af slagge fra affaldsforbrændingsanlæg	
Slagge fra januar 2015 til marts 2015	
Affaldsproducent:	HKV Horsens
Produktionssted:	HKV Horsens Endelavevej 7 8700 Horsens
Affaldsproducent:	Slagge fra affaldsforbrændingsanlæg
Kategorisering:	Ifølge vedlagte analyserapport kategoriseres slaggepartiet i kategori 3 jf. MST Bek 1662 af 21.12.2010
Rensningsproces:	Urenset slagge
Prevedtagningsmetode:	Driftsinstruks nr. 352 - 2001
Tid for prevedtagning:	september 2015
Batchudvaskningstest:	CEN pr. EV 12457-3 udkast af juni 1998.
Faststof test:	Egnet metode. Prøven oplukkes efter DS259.
Analyse tidspunkt:	17. - 23.09.2015
Laboratorium:	Eurofins Miljø A/S, Ladelundvej 85, 6600 Vejen
Analyseresultat:	Se vedlagte kopi af analysen.

Example of Danish Declaration for the use of recycled ash aggregate in a construction application



Ash Recycling in Europe

Throughout Europe approximately 18 million tonnes of Bottom ash per year:

- *Denmark* - Legislation has allowed bottom ash to be used in road construction for decades and now around 99% of bottom ash is recovered
- *Italy* - Gravel from bottom ash crushed and used as aggregate for concrete manufacturing
- *The Netherlands & Germany* - Bottom ash aggregates used in construction of roads, flyover for high ways and noise barriers
- *Switzerland* - Finer fraction of bottom ash used as cement substitute in fly ash stabilisation
- *United Kingdom* - Bottom ash aggregate in road construction and other applications i.e. 30,000 tonnes of bottom ash used as backfill for Olympic Park & 2,000 tonnes pavement capping
- *Belgium, France, Portugal, Spain* - all use Bottom ash aggregate in road construction

Source: CEWEP 2017



Ash Recycling in Europe

Throughout Europe approximately 18 million tonnes of Bottom ash per year:

The Netherlands - All operators of Waste-to-Energy plants signed a “Green Deal Bottom Ash” with the Dutch Government:

- 1) More than 75% recovery of all non-ferrous metals > 6 mm present in the bottom ash
- 2) From 2020 granulates must be so clean that they can be 100% applied for useful purposes.



Good example for Public-Private partnership enabling Dutch Government and Waste-to-Energy operators strive for clean and 100% applicable secondary building material.

Used in road construction, bridge and flyover embankments, sound walls, concrete products such as bricks, kerbstones, etc.

Source: CEWEP 2017



meldgaard plant on its way...



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