



# Recovery of resources in Bottom Ash – Status in Denmark

*Askedagen 2018, Energy Företagen, Stockholm, April 2018*

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# Overview

1. About Afatek
2. The key to recover fine metals
3. Next generation metal sorting plant
4. Minerals used in Road Construction
5. Conclusion – Where are we in the Circular Economy?

# About Afatek

- Owned by 5 public waste companies
- 6 WtE plants = 250.000 tons of Bottom Ash = 40 % of the DK market (East Denmark)
- 3 sites for treatment of BA
- Adm+R&D: 6 empl. Operations: 12 empl.
- All Bottom Ash is recovered in Denmark: 6 % ferrous, 2 % nonferrous, minerals for road construction



# The semi dry ash concept

# Wet Bottom Ash can be dried down to level 10–15 % H<sub>2</sub>O → Recovery of fine metals

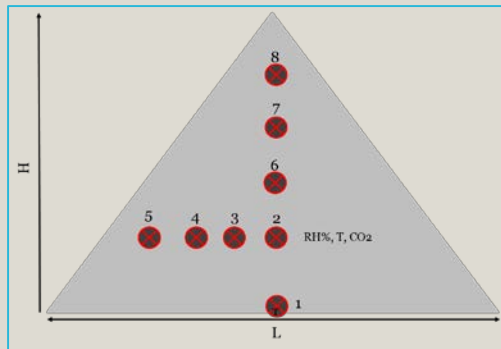
- Fine metals can be recovered from Bottom Ash – only if the water content is as low as 10 – 15 %
- We tested the screening
- We tested the metal separation
- We studied how the Bottom Ash dries out



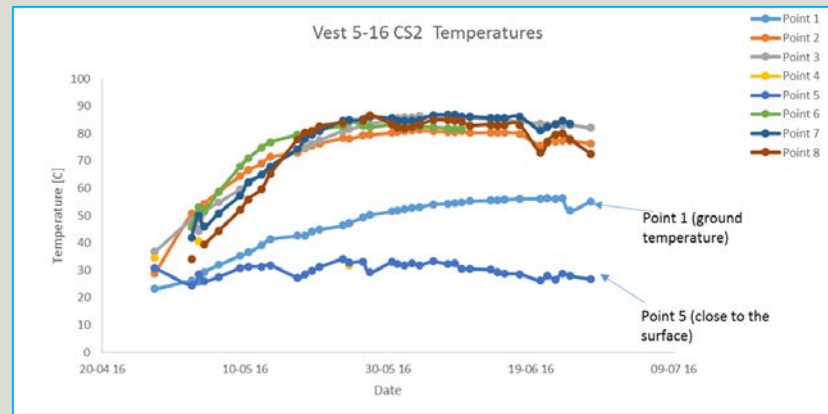
# Natural aging of Bottom Ash produce dry ash

Tests showed that dried up ash of about 10 - 15 % water can be screened down to 0,5 mm

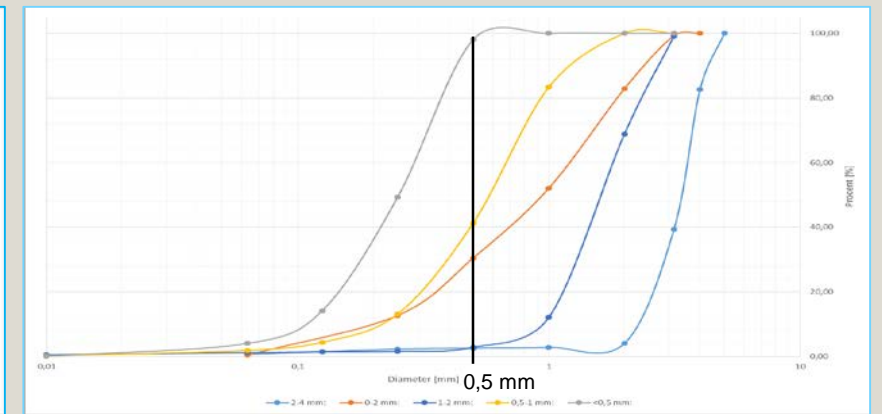
A maturation model was established - Chemical and Thermal



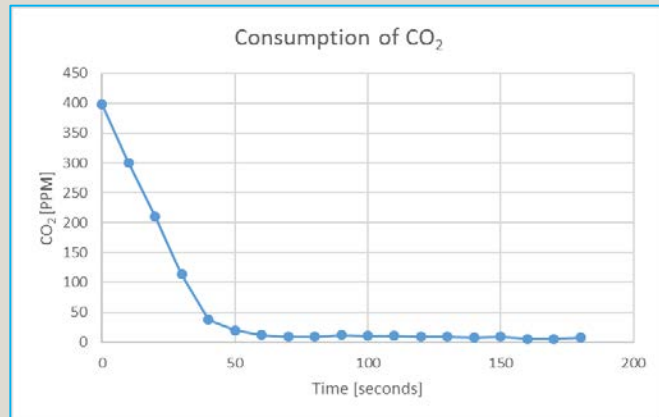
Temperature – drives out moisture



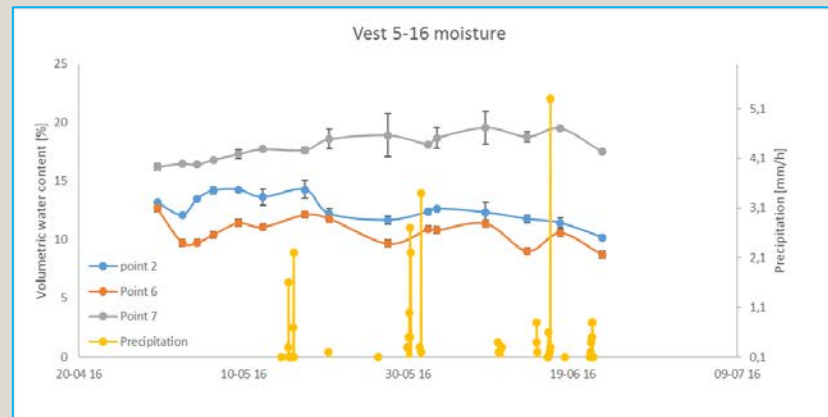
Screening efficiency



CO<sub>2</sub> consumption – limiting factor?



Water content – decrease over time

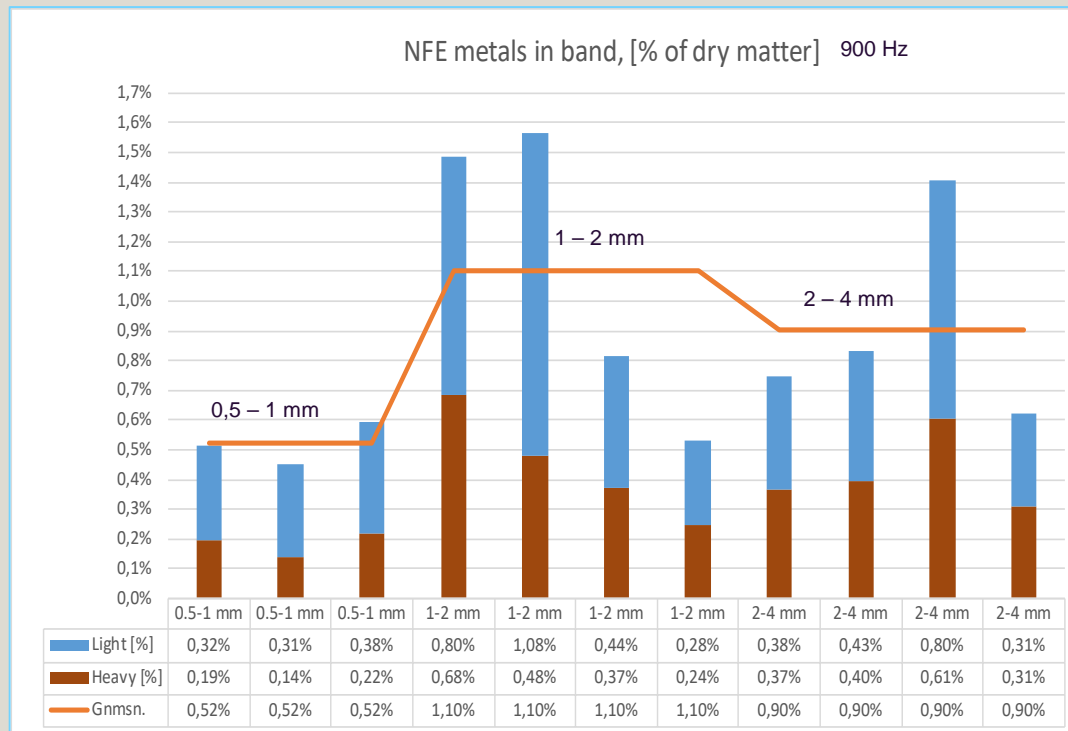


Clean cut screening - grainsize 2-4 mm

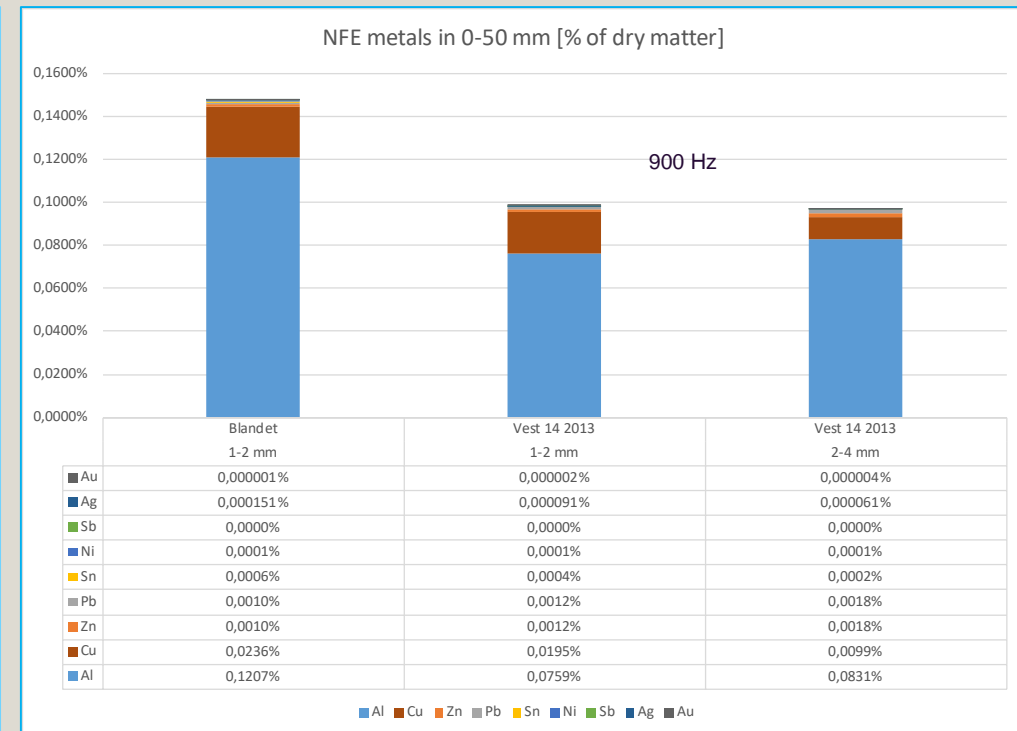


# We found copper, aluminium, silver and gold in the fines

## Rate and Composition of recovered metals



## Melting results

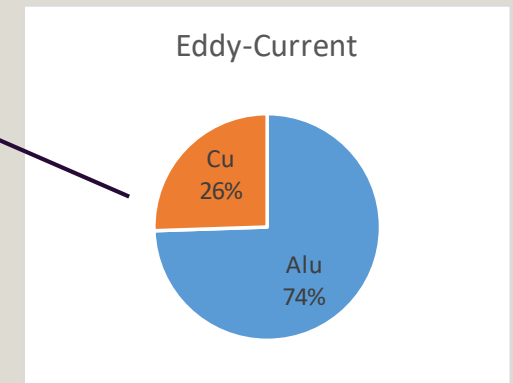
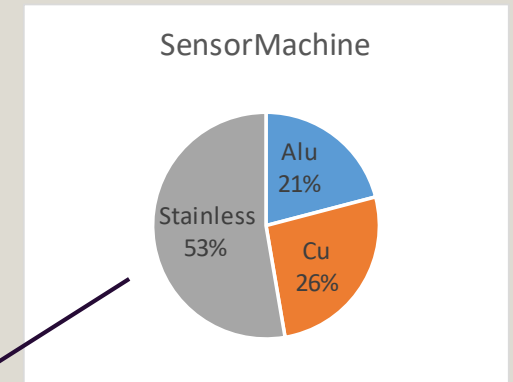
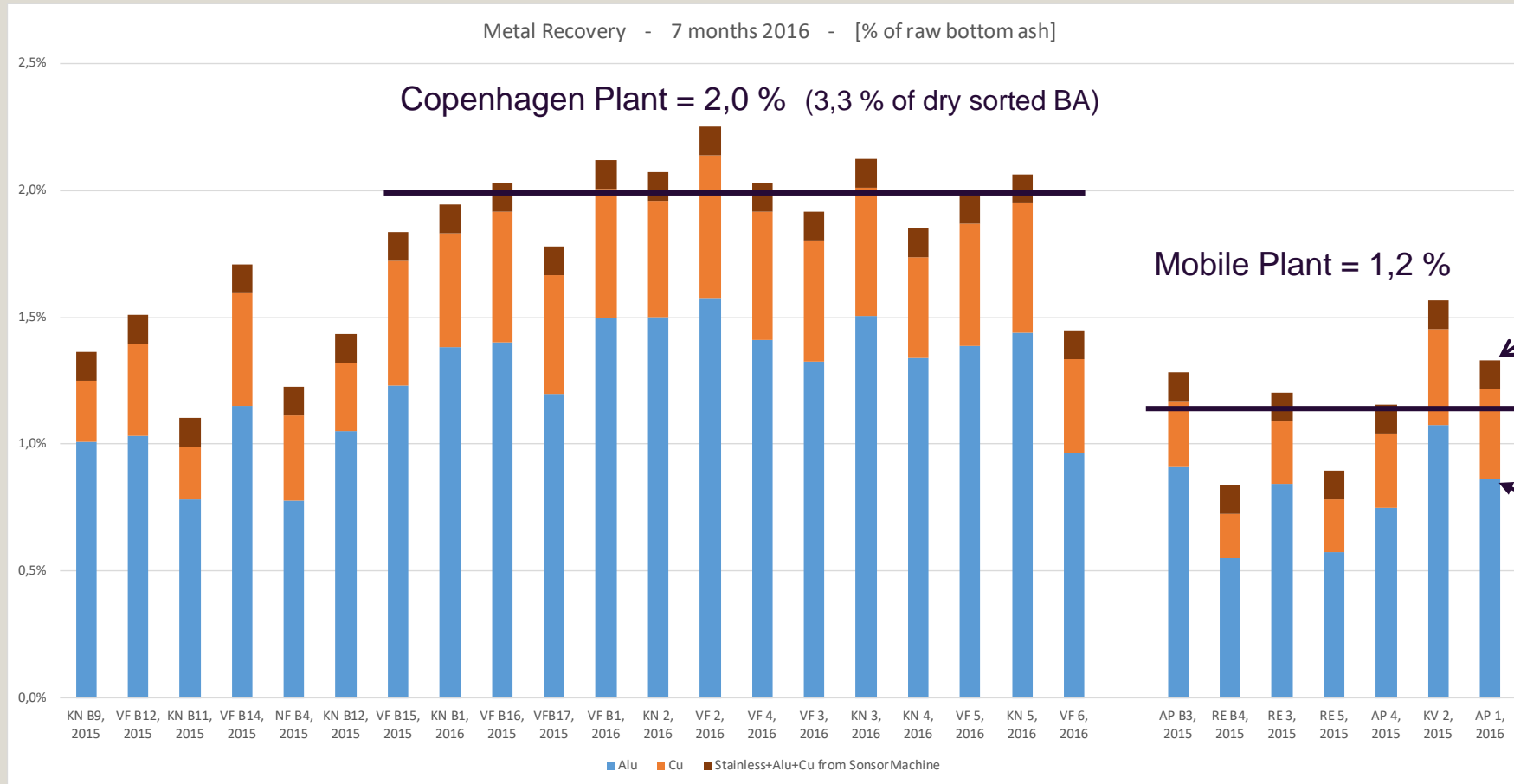


# Next Generation Sorting Plant

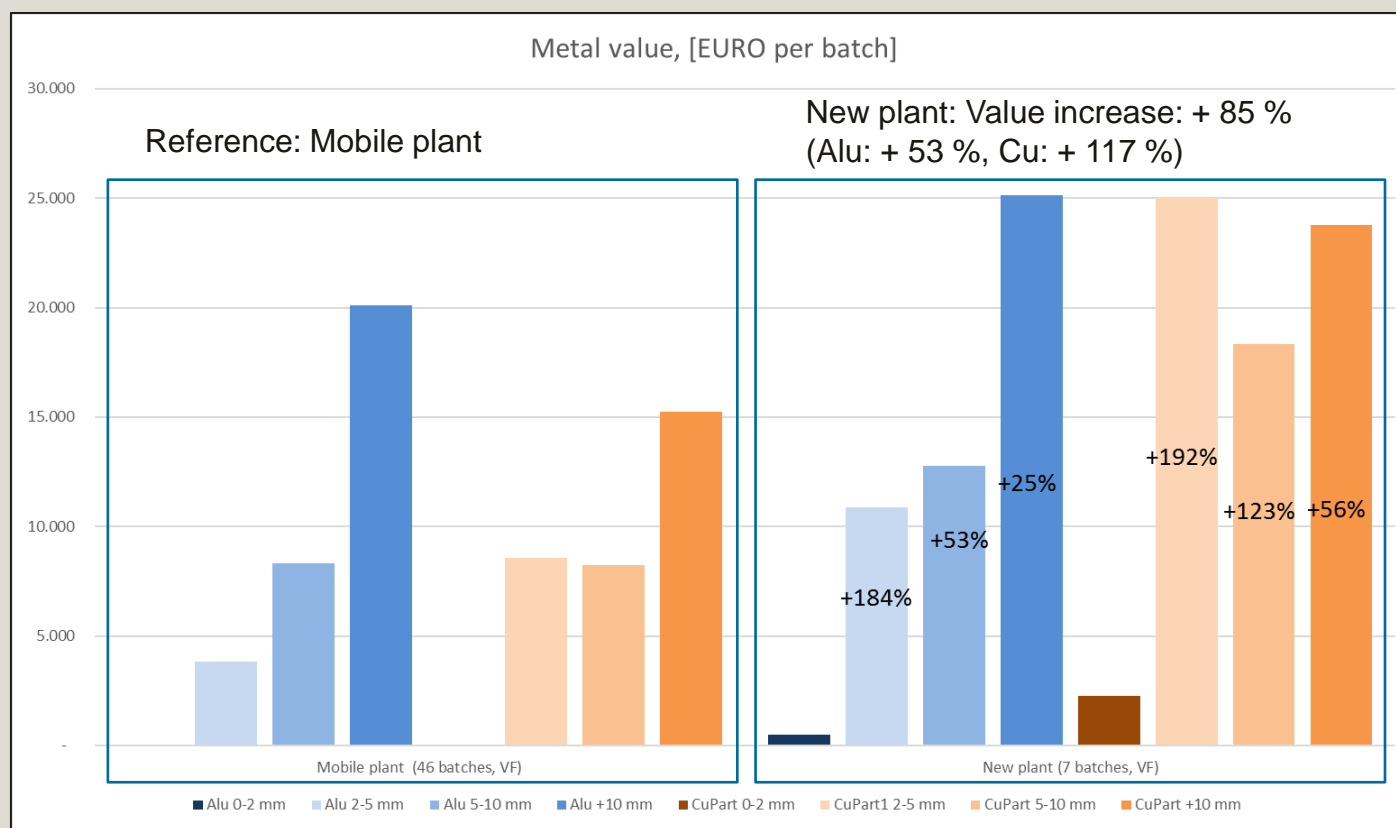




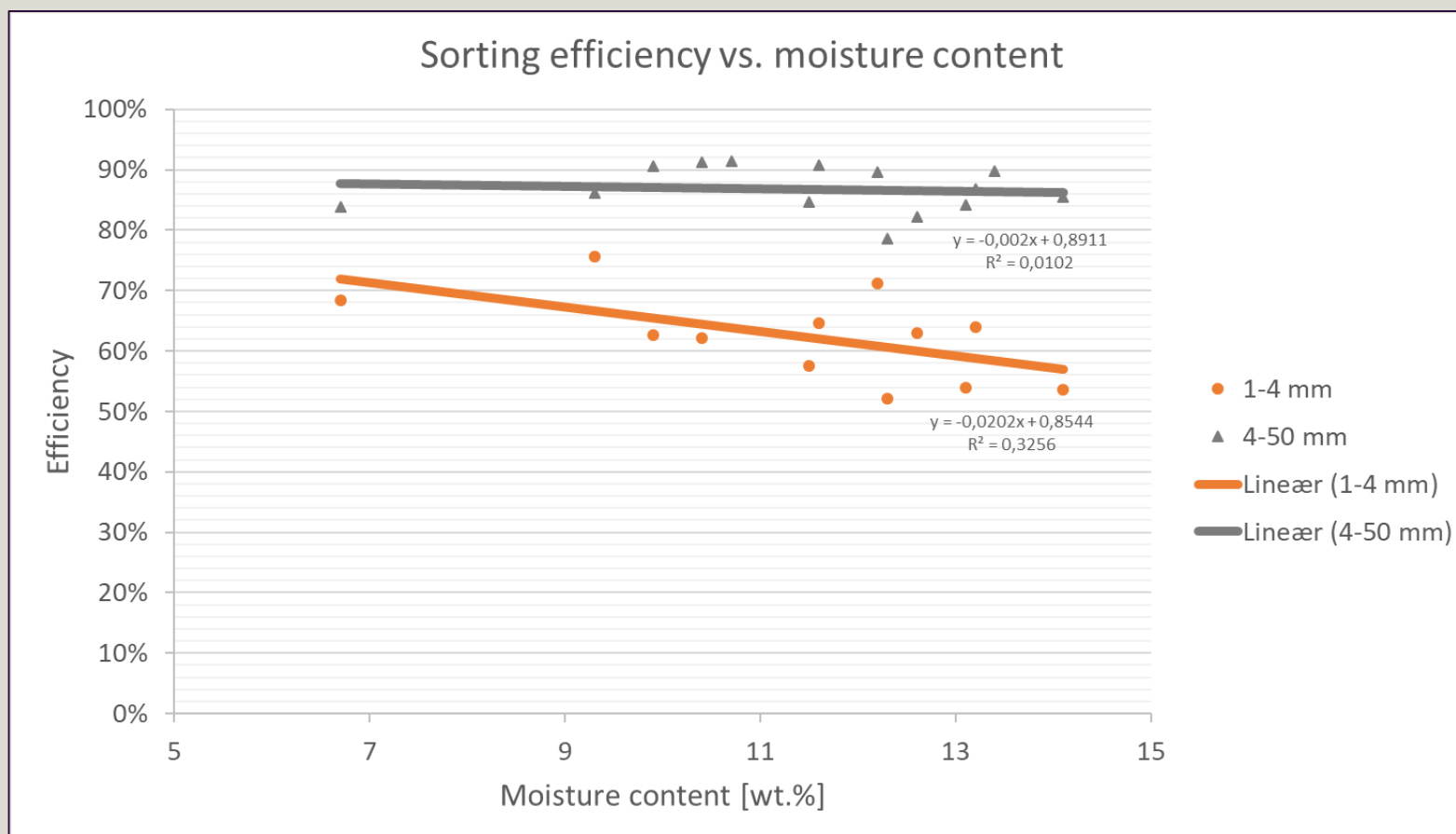
# Metals can be recovered with an efficiency of about 80 % - even from wet bottom ash



# We could almost double sales value of the metals

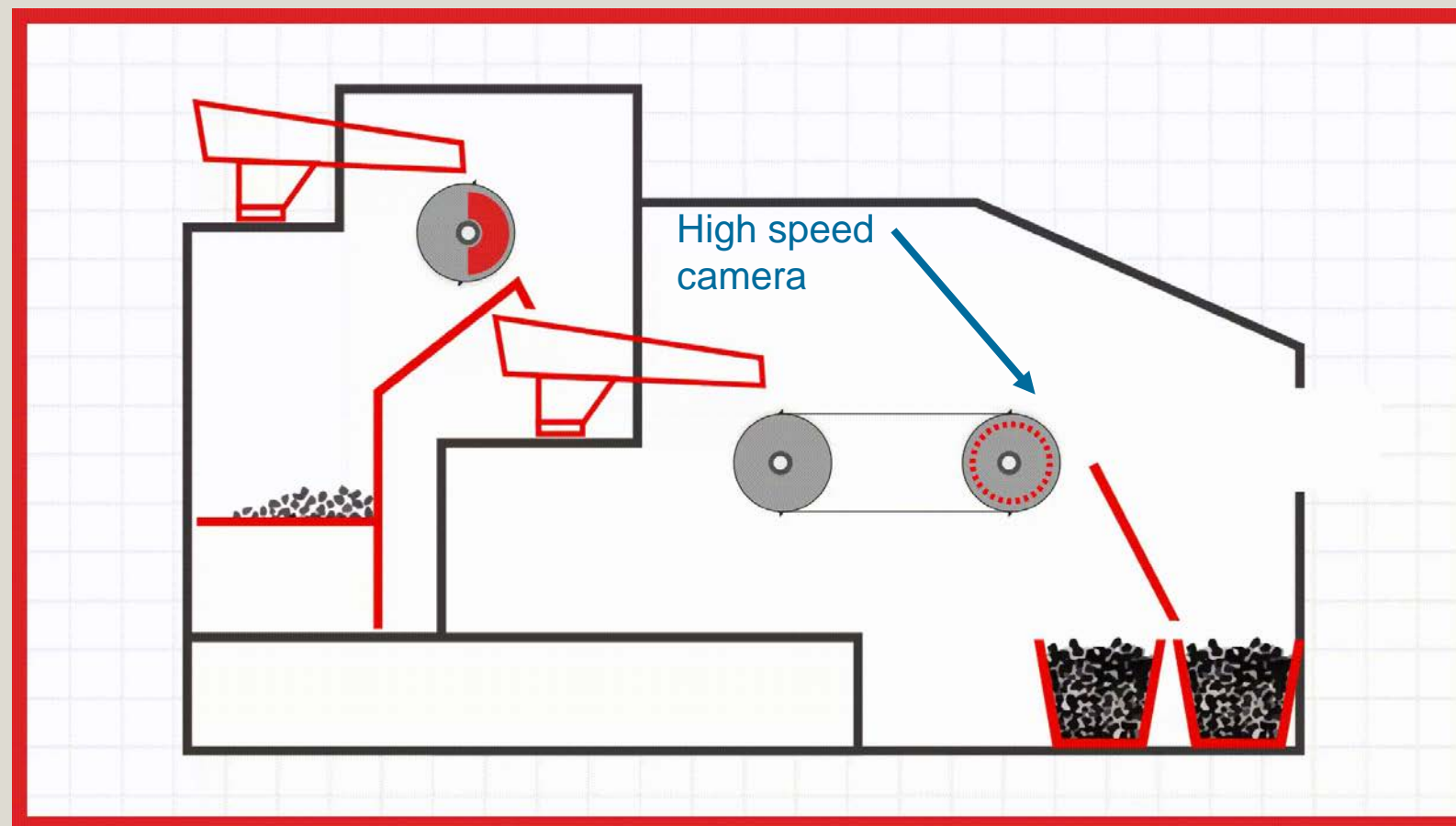


## Sorting Efficiency – dependence on water content



## Eddy-Current sorting technique + magnet taking fine iron

Fe: 1-4 mm (paper clips)



## Eddy-Current sorting of Al and Cu-fraction (18-50 mm)



## Eddy-Current sorting of Al and Cu-fraction (1-2 mm)



## Sensor sorting of Stainless-fraction (18-50 mm)





# **RECOVERY OF MINERALS**

## **- develop the business and the environment**

## Use of Bottom Ash Gravel in Road Construction is approved by the state authorities, high way department and the Government

Test road Nordhavn, Copenhagen

- Present: Limited traffic load
- Future: Unlimited traffic load
- Revision of standard for construction of roads, the Danish Road Directorate



# Bottom ash substitute high quality gravel in road construction

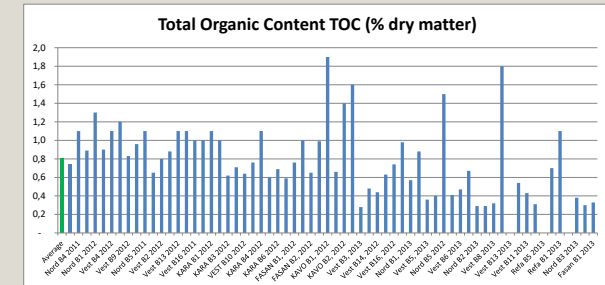
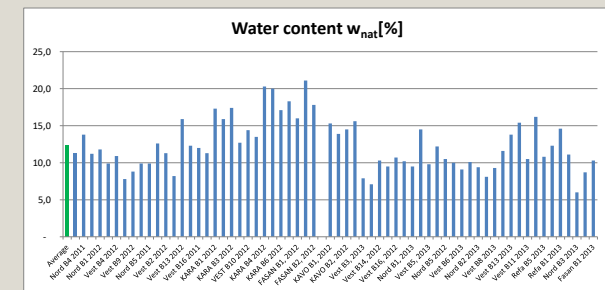
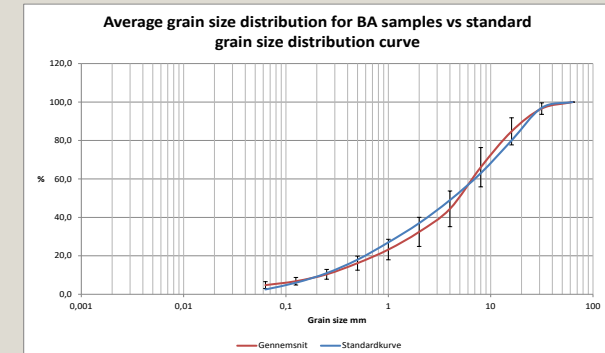
## All bottom ash is tested and declared in accordance to mechanical and physical properties:

- Water content
- Particle size distribution
- Density and water content needed for efficient compaction
- Classification test for the constituents of coarse recycled aggregate
- Total Organic Content (TOC)

## Result:

- Since march 2012 all supplies of BA gravel from Afatek is declared
- Information about the construction product is now available for both the constructor and the controlling authority
- The bearing capacity test of the road in Copenhagen, may lead to use of BA gravel in higher road classes

**Denmark has a long tradition for using BA in road construction – due to a clear national policy of using residues to substitute valuable virgin material**



# CONCLUSION



# Access to further information:

Learn more about Afatek and our projects at [www.afatek.dk](http://www.afatek.dk) - here you will also find access to our results and reports.

## Contact

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**AFATEK**  
- fra restprodukt til ressource

For side | Kontakt | Presse | English

Teknologien | Udviklingsprogram | Afsætning | Aktuelt | Cases | Om AFATEK

## Udvikling og innovation

Kun gennem forskning, udvikling og test får vi endnu mere ud af ressourcerne i slaggen.

Se udfordringen og løsningen

### Teknologien

I 2011 blev vores nye sorteringsanlæg sat i drift. Sorteringsanlægget er et af de mest avancerede anlæg på verdensplan.

Sorteringsanlæg i verdensklasse

### Udviklingsprogram

Vi udvikler vores virksomhed gennem test og demonstration og udvikling af nye behandlingsmetoder.

Udvikling gennem samarbejde

### Teknologien i brug

Slagge fra affaldsforbrænding har potentiale som tilslag. Nyt udviklingsprojekt skal belyse mulighederne for

Fælles indsats for metalsortering. AFATEK gennemfører i øjeblikket en ambitiøs innova

Se cases om AFATEKs løsninger

**AFATEK**  
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Tlf +45 39657200, [mail@afatek.dk](mailto:mail@afatek.dk)

AFATEK A/S behandler og genanvender slagge, der er et restprodukt fra energidrevet affald fra affaldsbehandlingscentre i Danmark. Vi udvikler og innoverer teknologier og metoder inden for genanvendelse af værdifulde ressourcer i slaggen.

**AKTUELT**  
5/7-2012  
Ny hjemmeside i luften

4/7-2012  
Artikel i Renoms årsavis 2012

8/6-2011  
Fiber produceret af slaggematerialer

**GENVEJE**  
Kontakt  
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Teknologien  
Udviklingsprogram  
Cases

**FA DEN NYESTE VIDEN**  
Få adgang til vores miljø- og analyse database og aktuelle udbud

Login på miljødatabase  
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Login på udbudsdatabase

Ønsker du adgang til vores databaser, skriv til [info@afatek.dk](mailto:info@afatek.dk).