– from residue to resource

Genvinding af metaller og slaggegrus

Dakofa Seminar, "Håndtering og genanvendelse af restprodukter" 5. september 2019

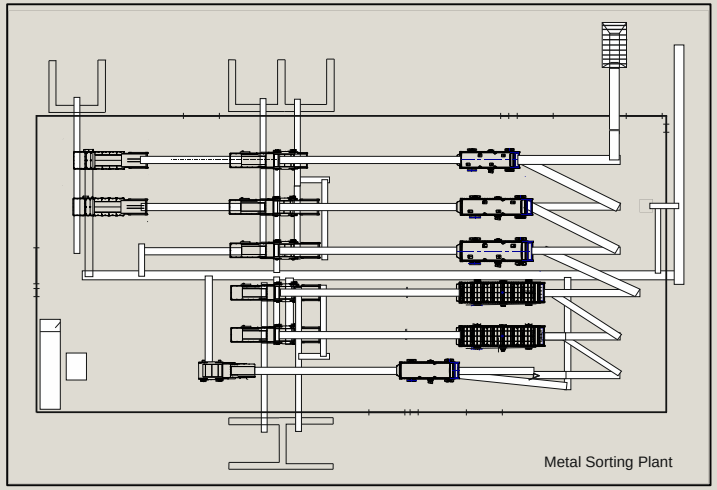
Jens Kallesøe, Afatek A/S

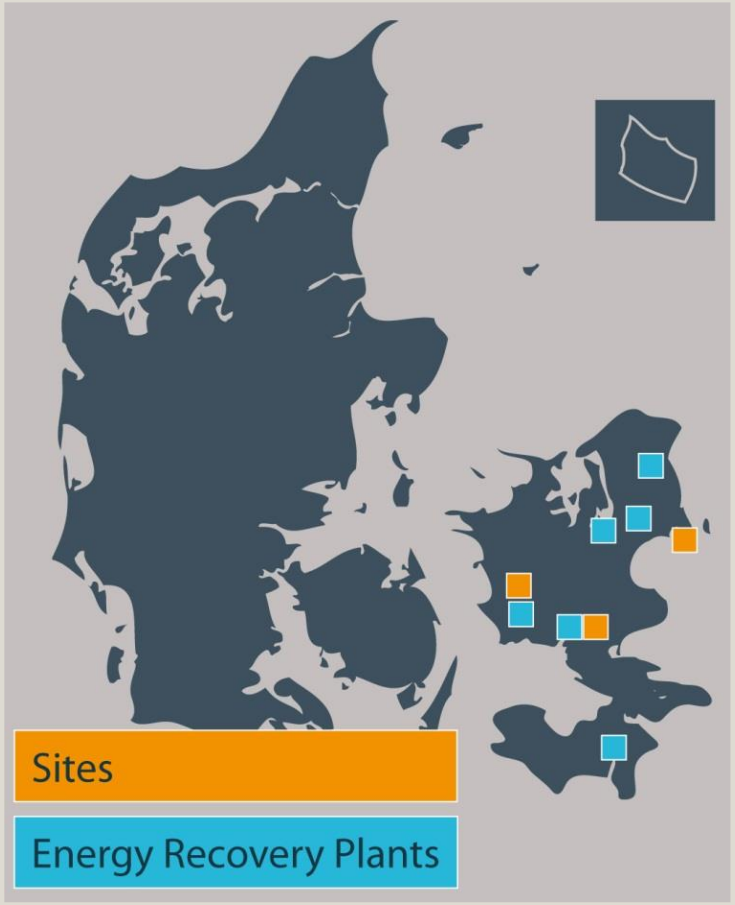
Overview

1. About Afatek
2. HP14 Classification Model
3. Up-grade and certify bottom ash gravel
4. Increase value – bring the material back into the Circle at the highest level
5. Recovery of metals
6. Conclusion

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
- 6-line metal sorting plant in operation since 2016:





HP14 Classification Model

HP14 Classification – presentation of model and results

AFATEK – from residue to resource

Step 1
- Screening for non-relevant HP's and POP substances

Step 2
- Informed worst-case assessment based on content of relevant substances
- Each element is assumed to be in its most critical substance (highest molecular weight)
- Only Cu and Zn are shown critical and examined further

Step 3
- Cu and Zn must be dissolved in water to show aquatic toxicity (only leachable amounts relevant)
- Worst-case leaching data at L/S=10 (from pH 7-12) inserted into the HP14 formulas

(Ref.: The model is developed by Danish Waste Solutions)

Approach:
- Bioavailability
- Only material in water phase can be aquatic/ecotoxic

Classification basis:
- Leaching tests from 6 WtE plants over 12 years
- pH-stat tests

Conclusion:
- Tests prove Non Hazardous
- All tests prove results with a good margin to the limits

When will we be in operation with HP14 Classification?

AFATEK – from residue to resource

Expected in operation:

- The Danish Environmental Protection Agency (EPA) is expected to approve the Danish Classification Model developed by Danish Waste Solutions/Afatek to be put into operation – until other models may prove better performance
- In this way a Best Practice is realised
- Important for us to get into operation with HP14 Classification tests

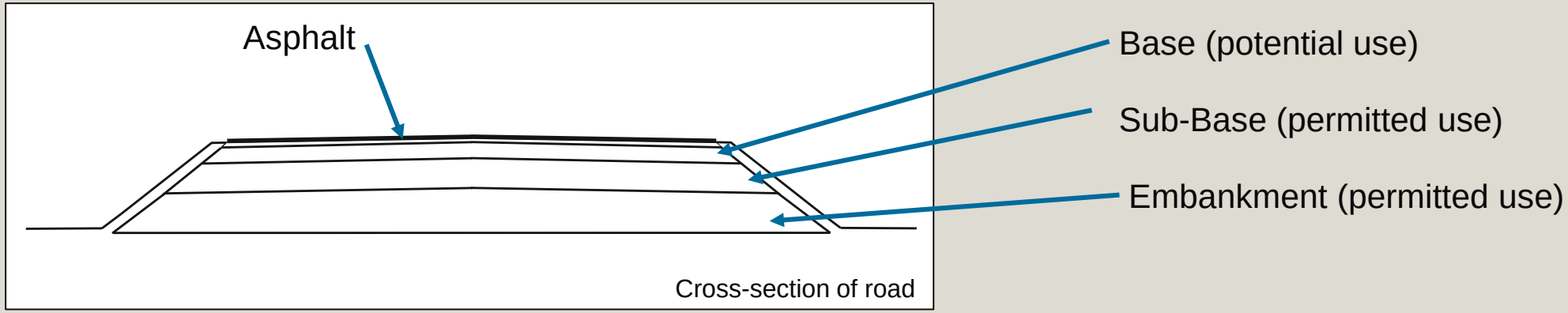
Strengthening of the environmental protection:

- HP14 Classification tests will now be added on top of leaching tests already carried out

– from residue to resource

Bottom Ash Gravel in Road Construction
Product Certificate

How do we use bottom ash gravel in Road Construction?



Present use (normal practice over a large number of years):

- Bottom ash gravel substitute lower gravel qualities in the Sub-Base (e.g. sand)
- Traffic class from 200 trucks/day => 600 trucks/day (new tests show potential for more traffic in future)

Potential use:

- Bottom ash gravel may substitute higher gravel qualities in the Base (e.g. stable gravel)
- Bottom ash gravel may be used in both Base and Sub-Base – simplify building in => reduced construction costs
- Cement reinforced bottom ash gravel in the Base may lead to reduced layer of the Tarmac (Asphalt) => reduced material costs

Product Certification as construction material for roads – based on quality demands (Norm) set by the Road Directorate

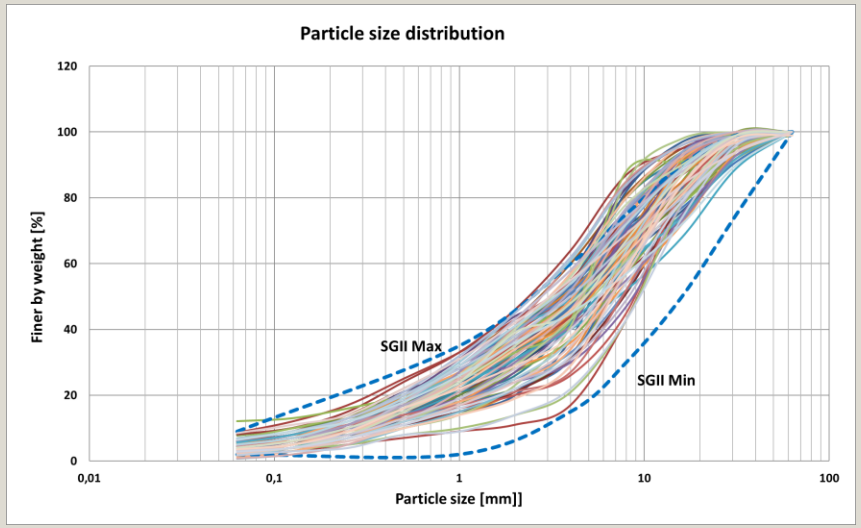
AFATEK – from residue to resource

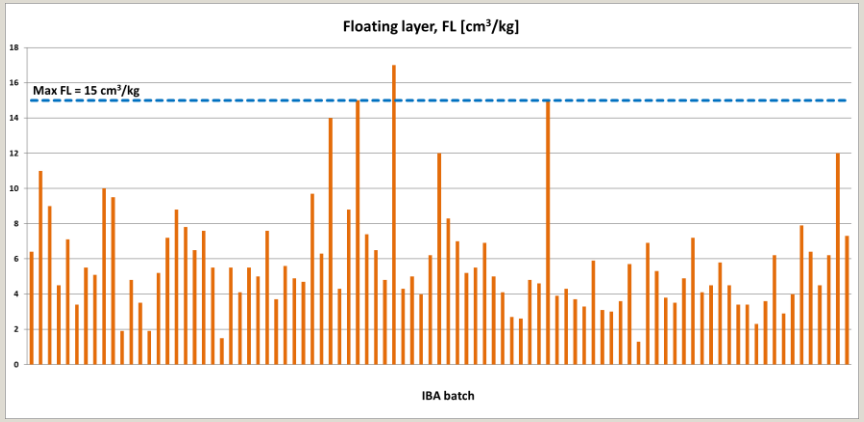
Quality requirements (defined by norm-setting authority, the Road Directorate):

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

Result:

- Since march 2012 all supplies of BA gravel from Afatek is declared
- Information about the construction product is now available for both the contractor and the controlling authority
- All BA gravel is used, also the fine particles

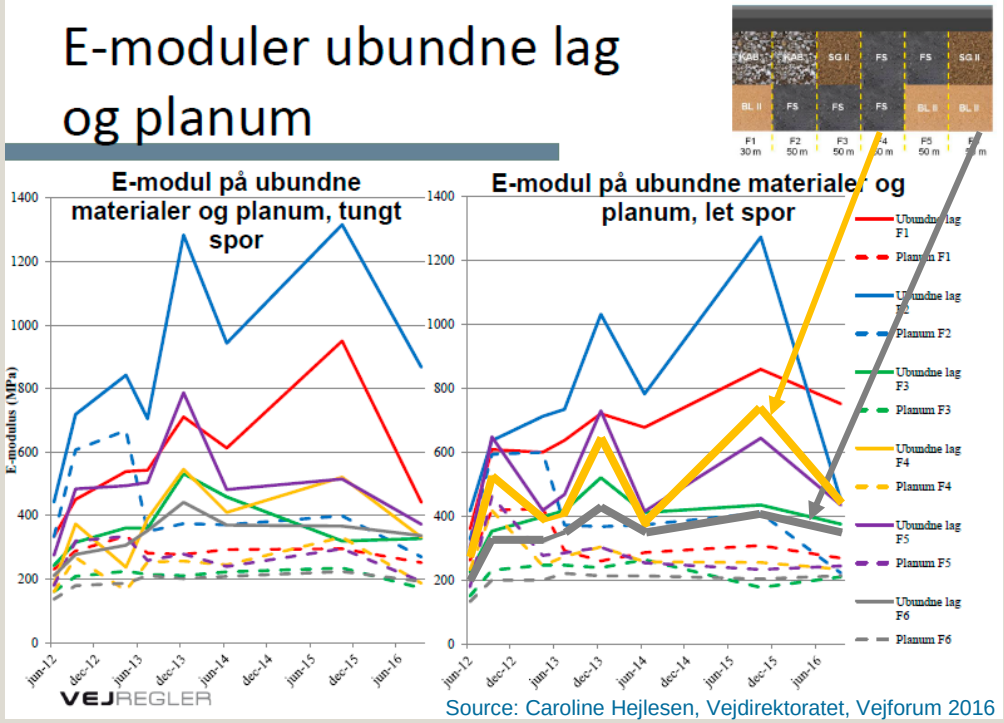




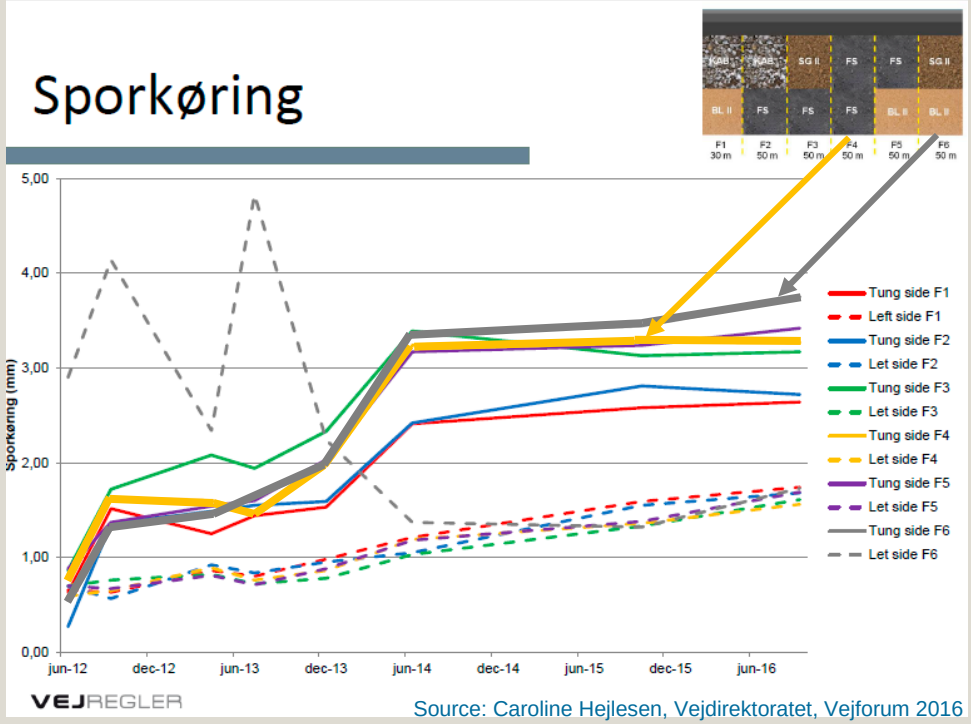
We have proved high bearing capacity – test in Copenhagen

AFATEK
– from residue to resource

Road Directorate test results: High bearing capacity proved - Candidate for use in the Base



Source: Caroline Hejlesen, Vejdirektoratet, Vejforum 2016



Source: Caroline Hejlesen, Vejdirektoratet, Vejforum 2016

Bearing Capacity results

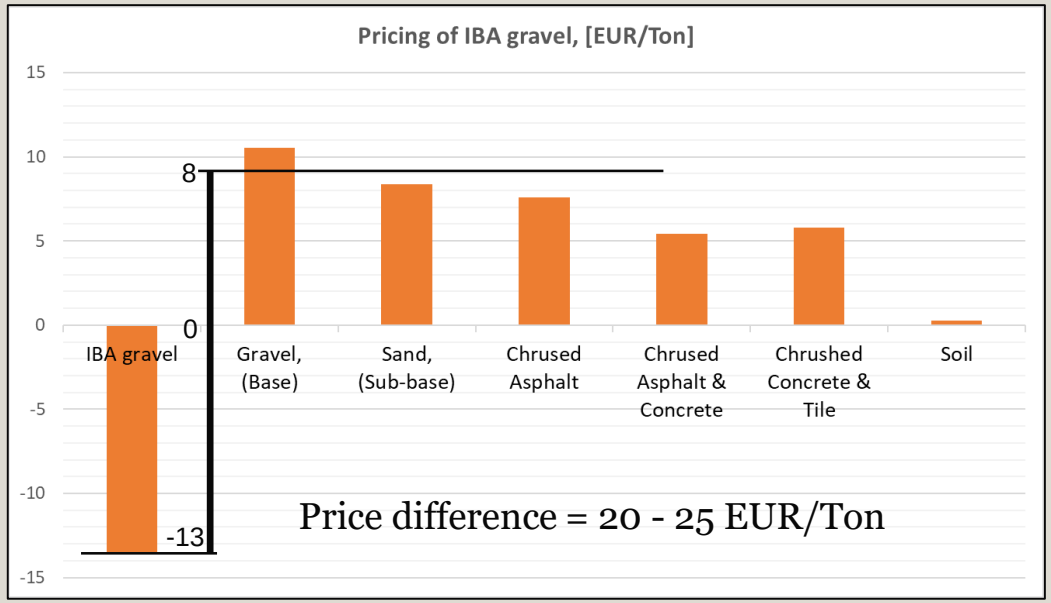
- Yellow higher than Grey – IBA gravel in both Base and Sub-Base higher than Reference
- Measurements over 5 years

Rut Depth results

- Yellow: Level 3 – 4 mm (Limit 10 - 15 mm)

How do we achieve the true value of the recovered gravel product?

Bringing the recovered product into the Circle as an End-Of-Waste product is not the only objective – how do we achieve the full value?



Pricing of the bottom ash gravel:

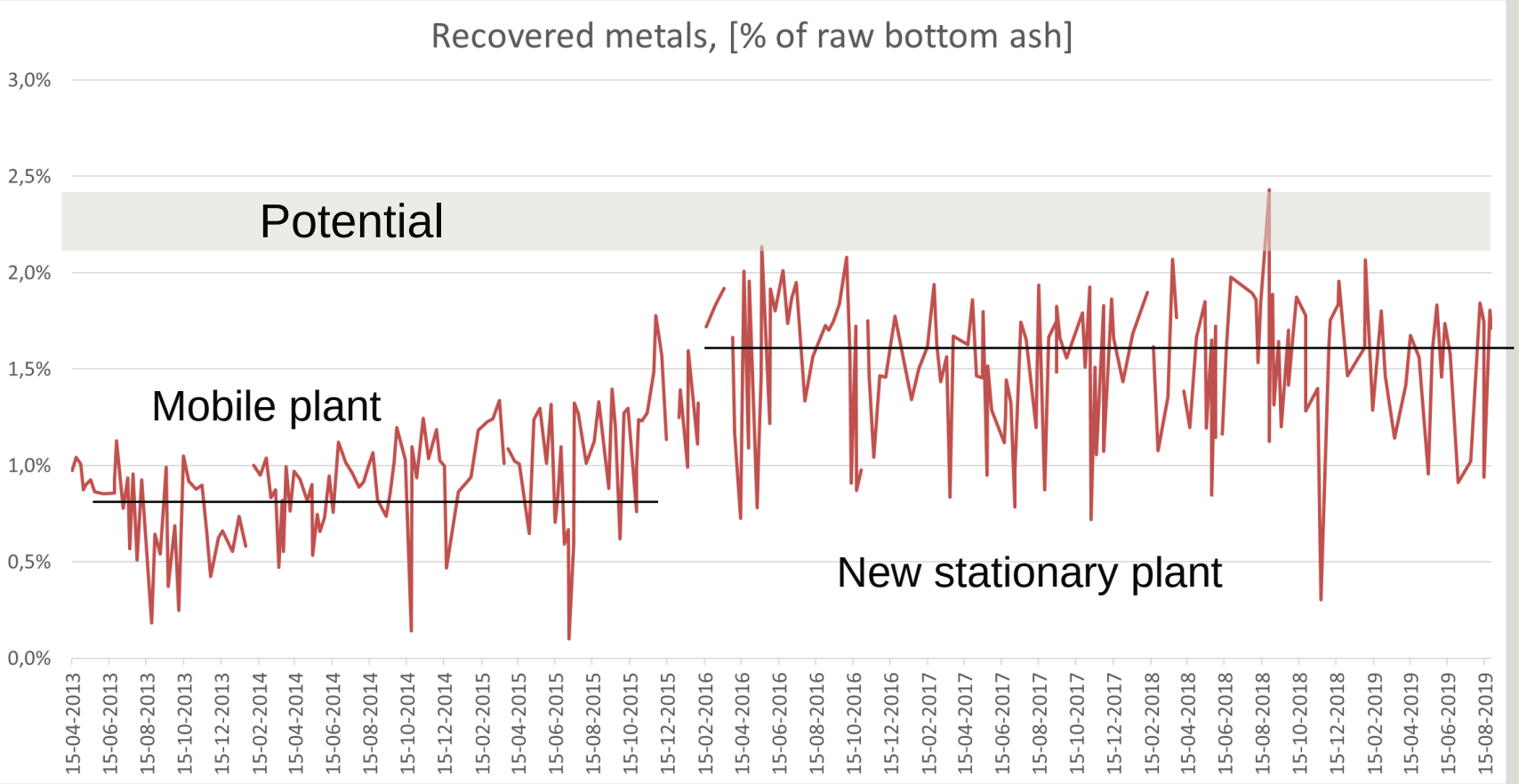
- Presently, price difference to virgin materials is around 20-25 EUR/ton
- Price gap should be reduced to 5 - 10 EUR/Ton (bottom ash gravel: Positive price)

Improvements (most important elements):

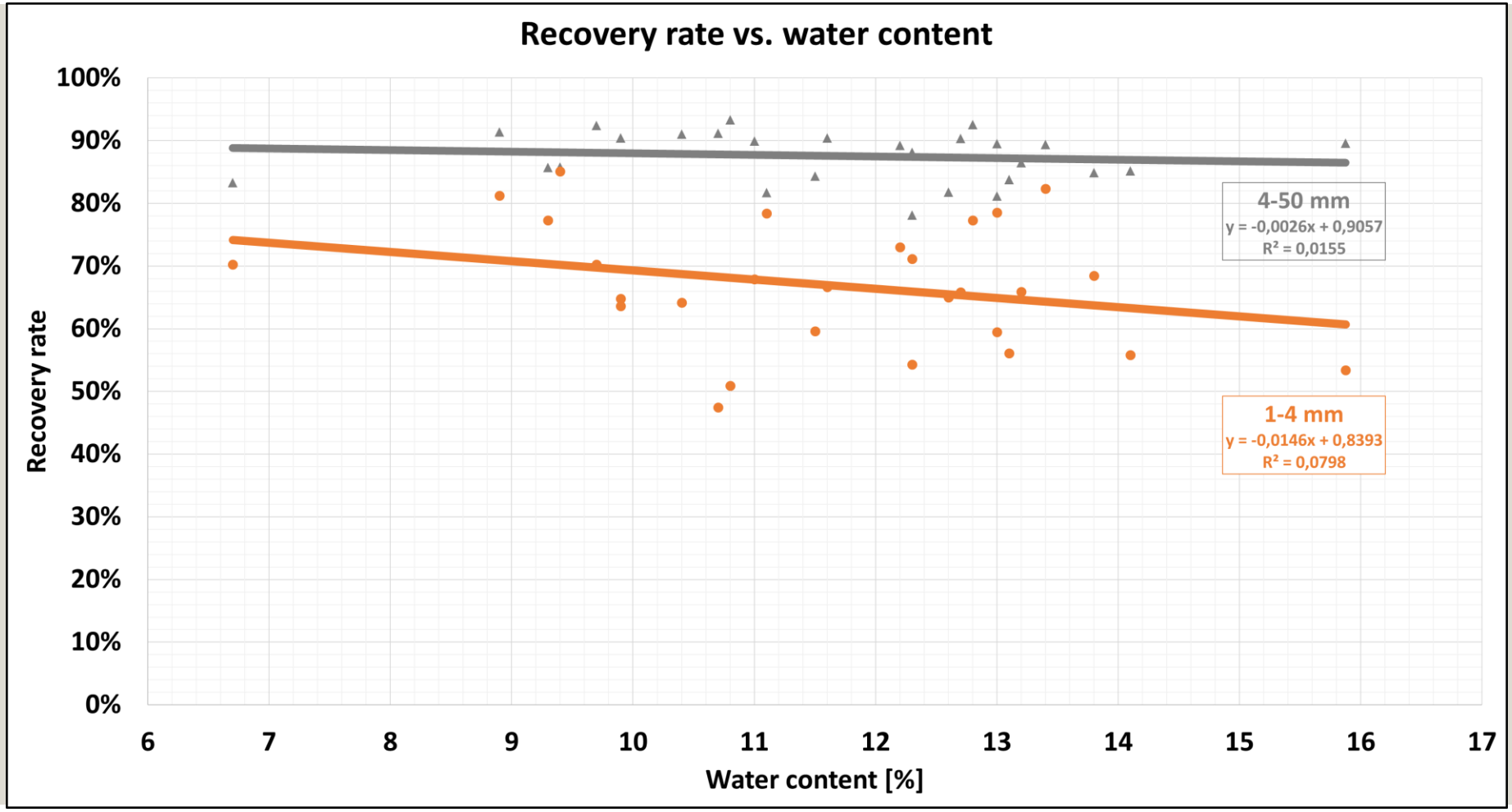
- Better quality of bottom ash gravel - certified
- Investment in a new large site – 200.000 m2/25 mill. EUR => Large projects supply: 100.000-500.000 tons per project, Negotiation power

Recovery of metals - trend

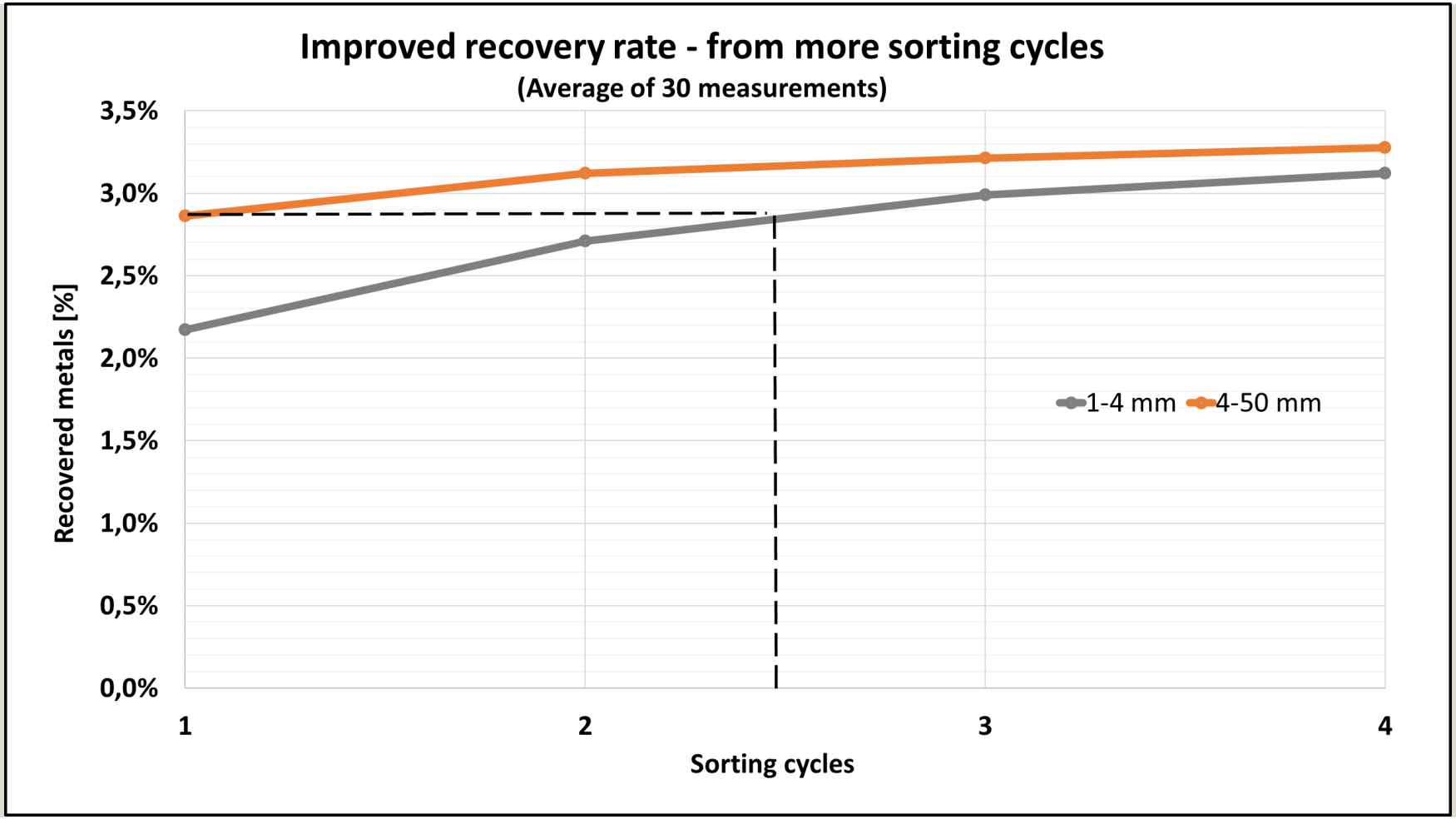
Recovered metals – do we detect a tendency to recline?



Sorting Efficiency of new plant – dependency on water content



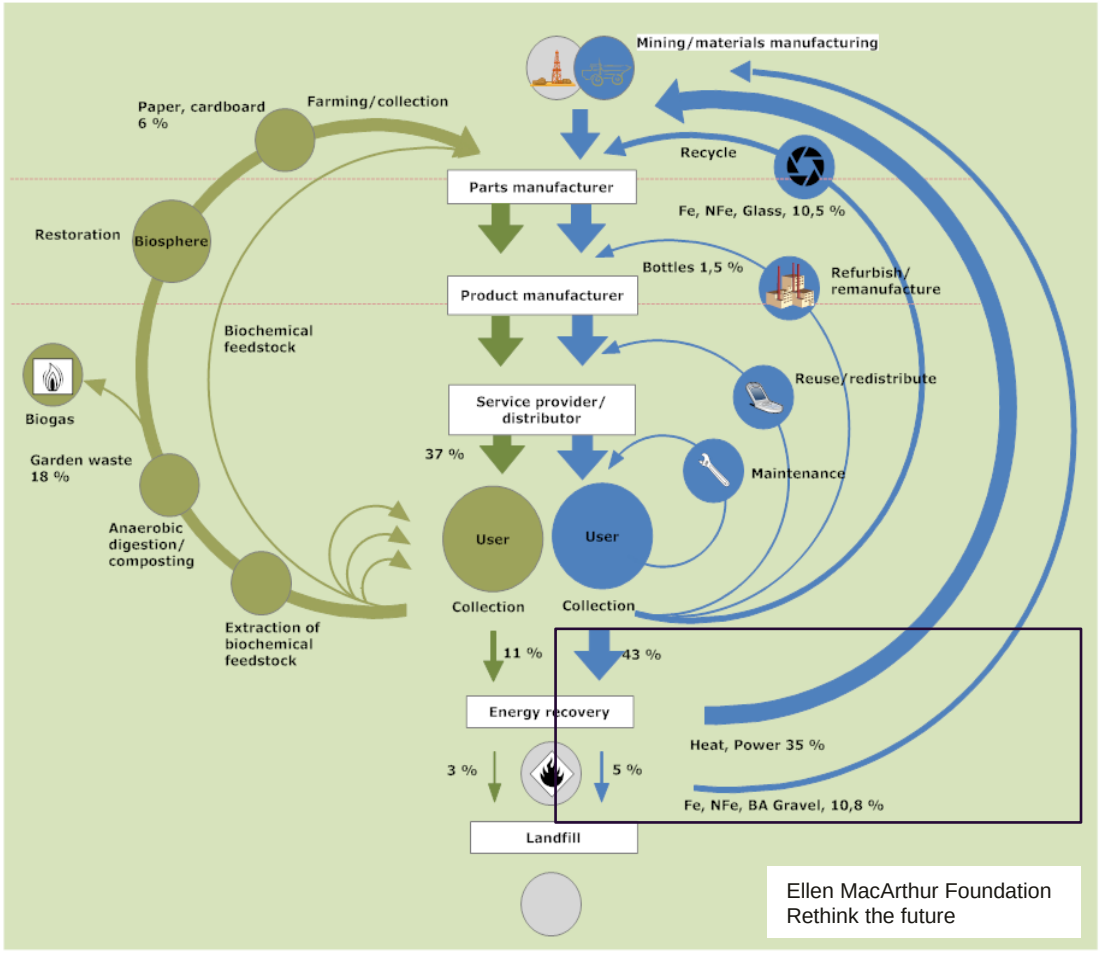
How much can we improve sorting efficiency?



CONCLUSION

HP14 classification is an important element in the pursue of bringing bottom ash into the Circle at the highest value level - and at the highest environmental safety

– from residue to resource



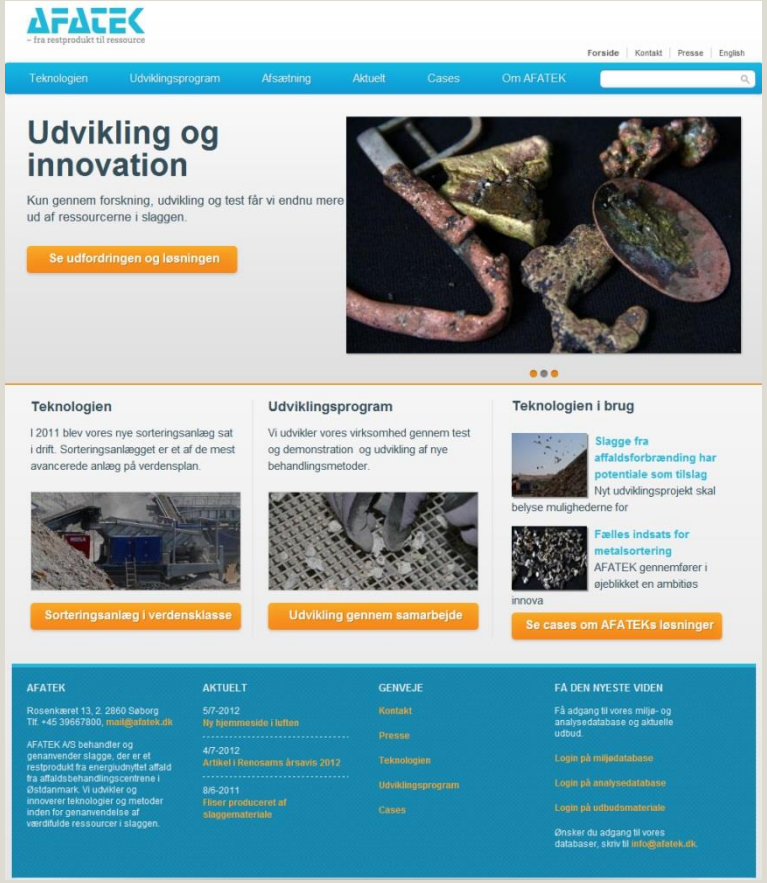
Conclusion:

- The HP14 classification is an extra security on top of the leaching tests
- Support refinement of the bottom ash gravel product (Certification, proven qualities as a Road Construction Product)
- All bottom ash minerals are recovered – and continue moving its way up in value creation

AFATEK
– from residue to resource

Access to further information:

Learn more about Afatek and our projects at www.afatek.dk - here you will also find access to our results and reports.



Contact

Jens Kallesøe

Afatek A/S

Selinevej 18

2300 Copenhagen

+45 41831013

jka@afatek.dk