



Workshop on Implementation of BAT Conclusions for Waste Incineration

Puzzle piece 2: Bottom ash and
water emissions

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Puzzle piece 2: bottom ash and water emissions

- Bottom ash handling, storage and treatment
- Water emissions
- BATAELs for water emissions from FGC and BA treatment



Definitions – BREF

Bottom ash treatment plant

Plant treating slags and/or bottom ashes from the incineration of waste in order to separate and recover the valuable fraction and to allow the beneficial use of the remaining fraction.

This does not include the sole separation of coarse metals at the incineration plant.

Fly ashes

Particles from the combustion chamber or formed within the flue-gas stream that are transported in the flue-gas.

Residues

Any liquid or solid waste which is generated by an incineration plant or by a bottom ash treatment plant.

Slags and/or bottom ashes

Solid residues removed from the furnace once wastes have been incinerated.



Definitions – Waste Framework Directive

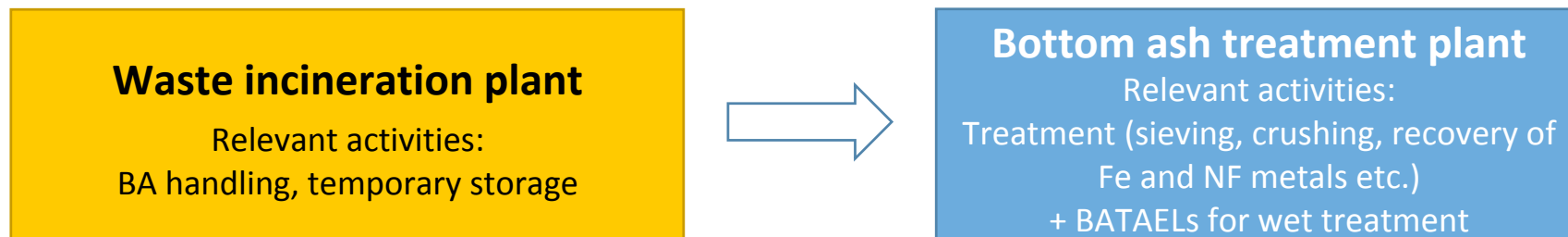
Treatment means recovery or disposal operations, including preparation prior to recovery or disposal;

e.g.

D 15: Storage pending any of the operations numbered D 1 to D 14 (**excluding temporary storage**, pending collection, on the site where the waste is produced)

R 13: Storage of waste pending any of the operations numbered R 1 to R 12 (**excluding temporary storage**, pending collection, on the site where the waste is produced)

Temporary storage of bottom ash in the waste incineration plant is not a treatment.



The 2 plants may be in the same installation, covered by the same permit!



Relevant BAT conclusions – BAT 7 and BAT 14

BAT is to monitor the content of unburnt substances in slags and bottom ashes at the incineration plant with at least the frequency given below and in accordance with EN standards.

Parameter	Minimum monitoring frequency	Monitoring associated with
Loss on ignition ⁽¹⁾	Once every three months	BAT 14
Total organic carbon ⁽¹⁾ ⁽²⁾		
<p>⁽¹⁾ Either the loss on ignition or the total organic carbon is monitored.</p> <p>⁽²⁾ Elemental carbon (e.g. determined according to DIN 19539) may be subtracted from the measurement result.</p>		

The upper end requirements are the same as in the IED Article 50.

The lower end of the BATAEPL is linked to fluidised bed or rotary kilns in slagging mode.

Parameter	Unit	BAT-AEPL
TOC content in slags and bottom ashes ⁽¹⁾	Dry wt-%	1–3 ⁽²⁾
Loss on ignition of slags and bottom ashes ⁽¹⁾	Dry wt-%	1–5 ⁽²⁾
<p>⁽¹⁾ Either the BAT-AEPL for TOC content or the BAT-AEPL for the loss on ignition applies.</p> <p>⁽²⁾ The lower end of the BAT-AEPL range can be achieved when using fluidised bed furnaces or rotary kilns operated in slagging mode.</p>		



Relevant BAT conclusions – BAT 24 and 26

In order to prevent or reduce diffuse dust emissions to air from the **treatment of slags and bottom ashes**, BAT is to use **an appropriate combination** of the techniques given below.

	Technique
a.	Enclose and cover equipment
b.	Limit height of discharge
c.	Protect stockpiles against prevailing winds
d.	Use water sprays
e.	Optimise moisture content
f.	Operate under subatmospheric pressure



Techniques commonly used also for the temporary storage of bottom ash to avoid a dusty environment.



Linked directly to BAT 26

In order to reduce channelled dust emissions to air from the enclosed treatment of slags and bottom ashes with extraction of air (see BAT 24 f), BAT is to treat the extracted air with a bag filter (see Section 5.2.2). + **BATAEL**



Parameter	BAT-AEL (mg/ Nm ³)	Averaging period
Dust	2–5	Average over the sampling period Once every year

Relevant BAT conclusions – BAT 35 and 36

BAT 35 In order to increase resource efficiency, BAT is to handle and treat bottom ashes separately from FGC residues.

BAT 36 In order to increase resource efficiency for the treatment of slags and bottom ashes, BAT is to use an appropriate combination of the techniques given below based on a risk assessment **depending on the hazardous properties of the slags and bottom ashes.**

a.	Screening and sieving
b.	Crushing
c.	Aeraulic separation
d.	Recovery of ferrous and non-ferrous metals
e.	Ageing
f.	Washing

BAT 36 is applicable only to bottom ash treatment plants.



Separation of coarse metals at the incineration plant is not included here.

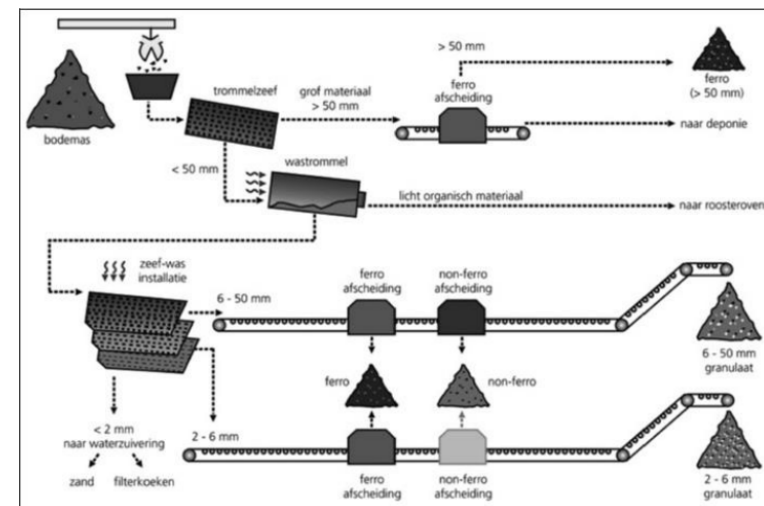
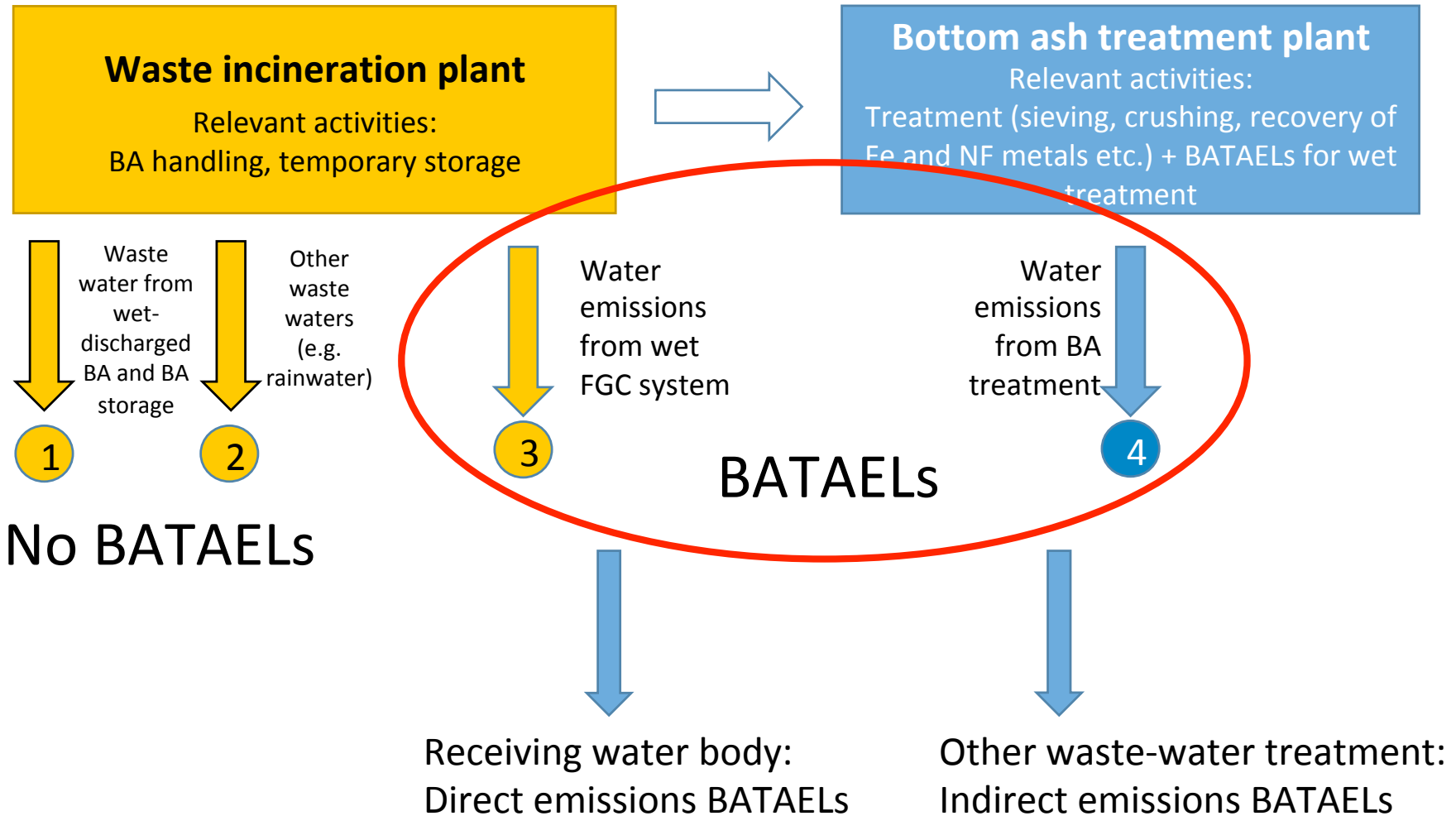


Figure 10: Wet bottom ash treatment, Indaver Beveren

Water emissions: sources

The 2 plants may be in the same installation, covered by the same permit!



Relevant BAT conclusions – BAT 34

In order to reduce emissions to water from **FGC** and/or from **the storage and treatment** of slags and bottom ashes, BAT is to use **an appropriate combination** of the techniques given below, and to use secondary techniques as close as possible to the source in order to avoid dilution.

	Technique	Typical pollutants targeted
Primary techniques		
a.	Optimisation of the incineration process (see BAT 14) and/or of the FGC system (e.g. SNCR/SCR, see BAT 29 (f))	Organic compounds including PCDD/F, ammonia/ammonium
Secondary techniques ⁽¹⁾		
Preliminary and primary treatment		
b.	Equalisation	All pollutants
c.	Neutralisation	Acids, alkalis
d.	Physical separation, e.g. screens, sieves, grit separators, primary settlement tanks	Gross solids, suspended solids
Physico-chemical treatment		
e.	Adsorption on activated carbon	Organic compounds including PCDD/F, mercury
f.	Precipitation	Dissolved metals/metalloids, sulphate
g.	Oxidation	Sulphide, sulphite, organic compounds
h.	Ion exchange	Dissolved metals/metalloids
i.	Stripping	Purgeable pollutants (e.g. ammonia/ammonium)
j.	Reverse osmosis	Ammonia/ammonium, metals/metalloids, sulphate, chloride, organic compounds
Final solids removal		
k.	Coagulation and flocculation	Suspended solids, particulate-bound metals/metalloids
l.	Sedimentation	
m.	Filtration	
n.	Flotation	

Incineration plant

Bottom ash treatment plant



⁽¹⁾ The Development of the Technical Reference for Implementation of BAT Conclusions for Waste Incineration, Brussels, 04.06.2019

Water emissions – BATAELs



Indirect emissions

Monitoring is in BAT 6



Once every day

Bottom ash treatment plants

Parameter		Process	Unit	BAT-AEL (1)	IED Annex VI				
Total suspended solids (TSS)		FGC	mg/l	10–30	30 (95%) - 45				
Total organic carbon (TOC)		BA treatment		mg/l	10–30	30 (95%) - 45			
		FGC							
Total organic carbon (TOC)		BA treatment					15–40	x	
Metals and metalloids	As	FGC					0.01–0.05	0,15	
	Cd	FGC					0.005–0.03	0,05	
	Cr	FGC					0.01–0.1	0,5	
	Cu	FGC					0.03–0.15	0,5	
	Hg	FGC					0.001–0.01	0,03	
	Ni	FGC					0.03–0.15	0,5	
	Pb	FGC					0.02–0.06	0,2	
	Ammonium-nitrogen (NH ₄ -N)						BA treatment	10–30	x
	Sulphate (SO ₄ ²⁻)						BA treatment	400–1 000	x
PCDD/F		FGC					ng I-TEQ/l	0.01–0.05	0,3

Once every month

Footnote on indirect emissions: These BATAELs may not apply to indirect emissions (external WWTP releases) if the waste water treatment plant downstream of the site is designed and equipped to reduce these pollutants, provided that this does not result in higher level of pollution in the environment.



Relevant BAT conclusions – BAT 32 and BAT 33

BAT 32 In order to prevent the contamination of uncontaminated water, to reduce emissions to water, and to increase resource efficiency, BAT is to segregate waste water streams and to treat them separately, depending on their characteristics.

BAT 33 In order to reduce water usage and to prevent or reduce the generation of waste water from the incineration plant, BAT is to use one or a combination of the techniques given below.

w	Technique
a.	Waste-water-free FGC techniques
b.	Injection of waste water from FGC
c.	Water reuse/recycling
d.	Dry bottom ash handling

There may be technical restrictions that prevent retrofitting to existing incineration plants.



Thank you!

Questions?