Workshop on Implementation of BAT Conclusions for Waste Incineration

How to apply WI BAT Conclusions – a practical case

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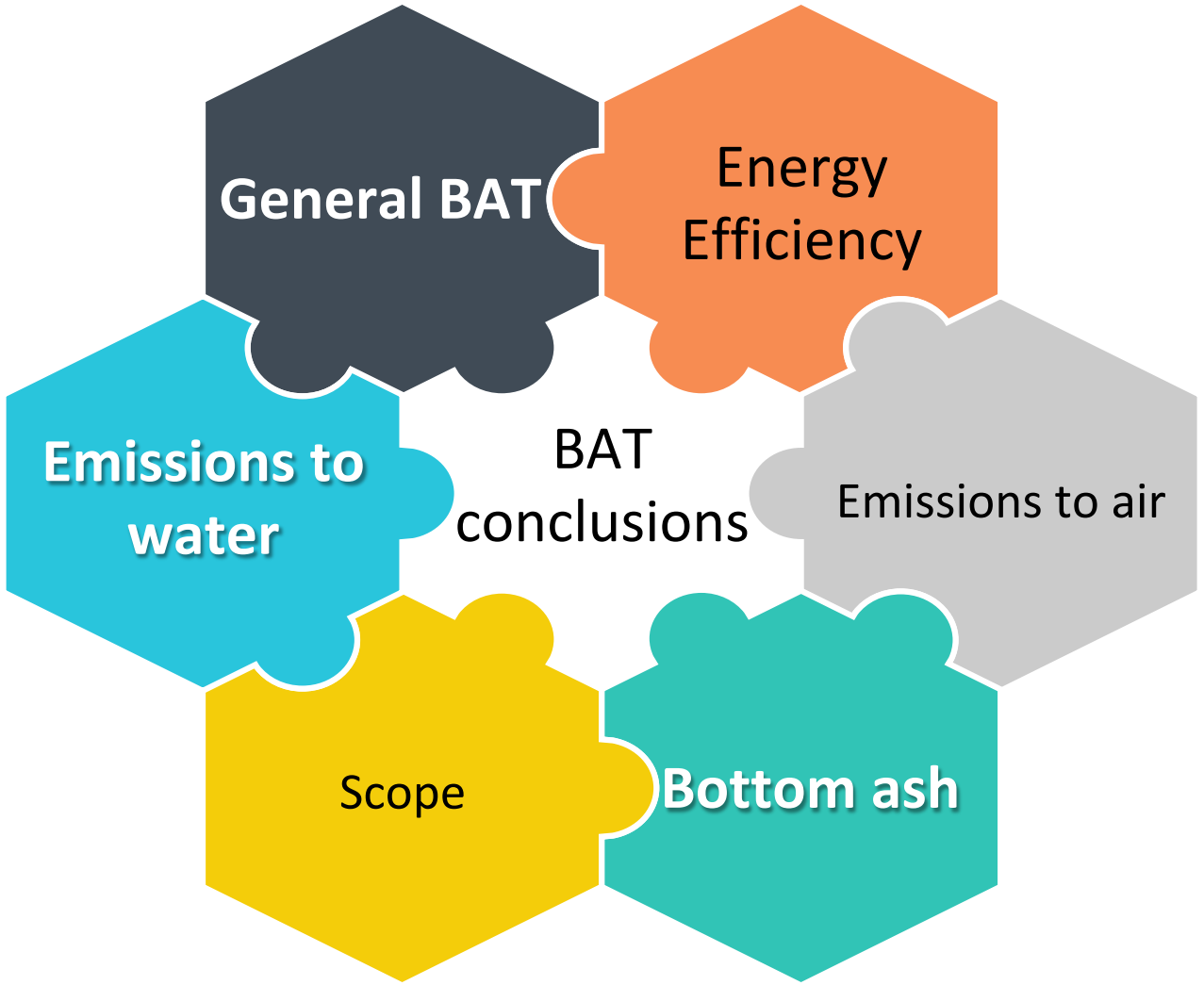
The puzzle:


General BAT
Energy Efficiency
Emissions to water
BAT conclusions
Emissions to air
Scope
Bottom ash

Disclaimer

"*The list of techniques described in the BAT conclusions is neither prescriptive, nor exhaustive. Other techniques may be used that ensure* ***at least an equivalent level of environmental protection****."* *Commission Implementing Decision 2012/119/EU*

"BAT conclusions should be the reference for setting permit conditions. They can be supplemented by other sources." *IED recital (13)*

Also for BATAELs, according to IED article 15.3 (b), « *it is possible to set different emission limit values than those referred to under point (a) in terms of values, periods of time and reference conditions* »

Competent authority can always put stricter requirements than the ones prescribed by the IED 2010/75/EU or recommended by the BAT conclusions

BAT-c compliance via traffic lights:

BAT conclusions being the reference, the procedure is to check the 37 BAT-c

Red light

BAT-c is not yet implemented in the plant.

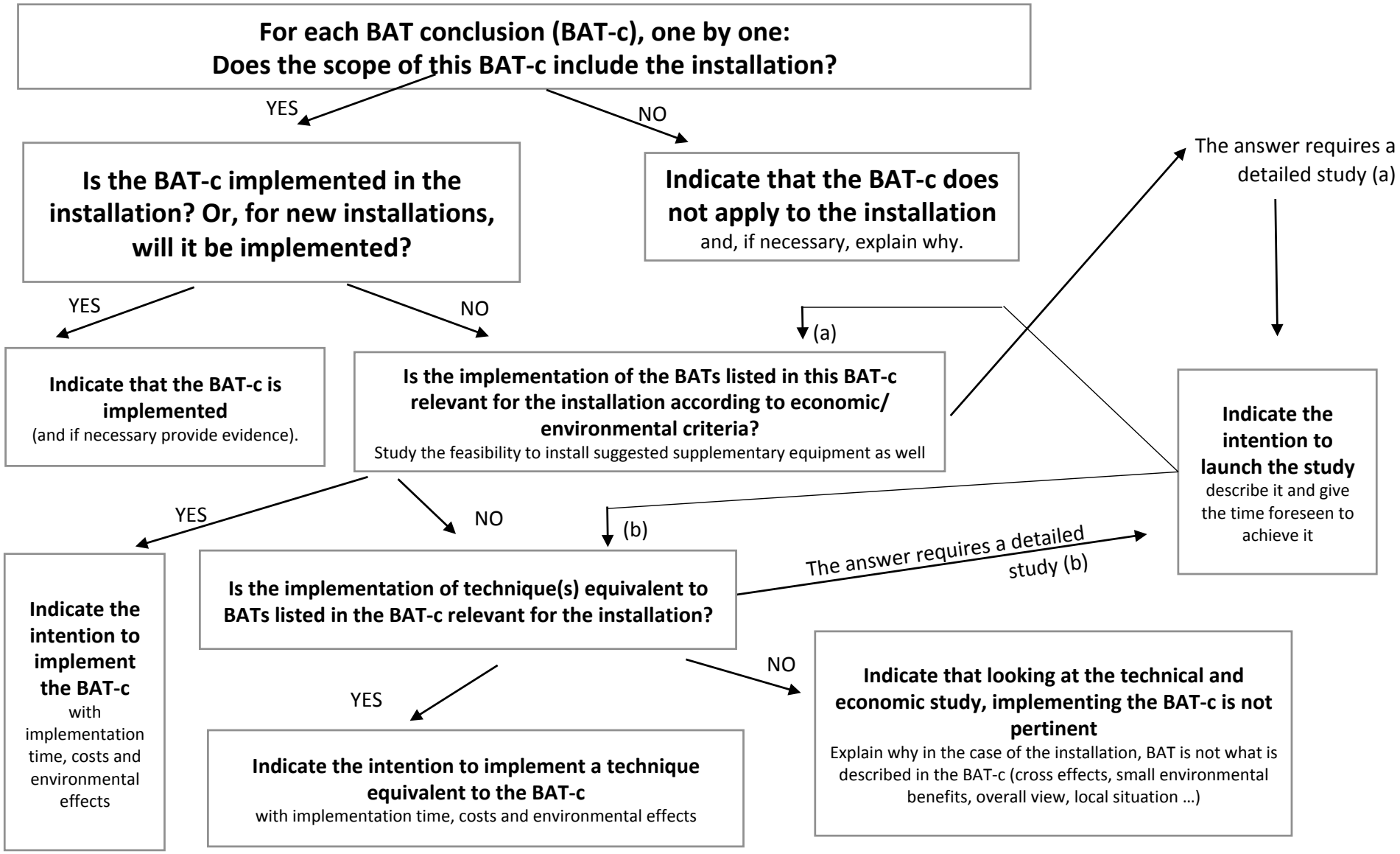
Yellow light

There may be need to further check if the BAT-c is implemented

Green light

BAT-c is already implemented in the plant.

BAT-c Compliance check – decision tree



Scope

These BAT conclusions concern the following activities specified in Annex I to Directive 2010/75/EU:

5.2 Disposal or recovery of waste in waste incineration plants:

- **(a) for non-hazardous waste with a capacity exceeding 3 tonnes per hour;**
- (b) for hazardous waste with a capacity exceeding 10 tonnes per day.

Modena plant **26-27 tonnes/hour**

1 line: around 210’000 tonnes/year

The permit limit is bound to the input waste thermal power

Bologna plant **27-28 tonnes/hour**

2 lines: total 220’000 tonnes/year

+

3500 tonnes/year clinical waste

For your information!

Scope

- Possible issue: loophole

5.2 Disposal or recovery of waste in waste co-incineration plants:

(a) for non-hazardous waste with a capacity exceeding 3 tonnes per hour;

(b) for hazardous waste with a capacity exceeding 10 tonnes per day;

whose main purpose is not the production of material products and where at least one of the following conditions is fulfilled:

- only waste, **other than waste defined in Article 3(31)(b) of Directive 2010/75/EU,** is combusted;
- more than 40 % of the resulting heat release comes from hazardous waste;
- mixed municipal waste is combusted.

Article 3(31)(b): biomass as the following waste

(i) vegetable waste from agriculture and forestry; (ii) vegetable waste from the food processing industry, if the heat generated is recovered; (iii) fibrous vegetable waste from virgin pulp production and from production of paper from pulp, if it is co-incinerated at the place of production and the heat generated is recovered;

Technically, if a co-incineration plant co-incinerates **also biomass** as in article 3(31)b, it could be out of the scope of these BAT conclusions. If the Thermal input is <50 MW it is also outside the scope of the LCP BREF!

BAT-c 1 - Environmental management system

BAT n°1 requires *"in order to improve the overall environmental performance, BAT is to elaborate and implement an environmental management system (EMS) that incorporates"* 20 general features and 8 additional features, specific to incineration plants and/or, where relevant, to bottom ash treatment plants.

The 20 first requirements of BAT-c1 are included in the requirements of **EMAS and ISO 14001 standard**, which the plant have.

5 of these 8 features are addressed by other BAT conclusions (**BAT 9, 10, 18, 23, 37**).

To be further checked in the Relevant BAT- C

Both plants have EMAS and ISO 14001 certification

Management PLAN for:

1. Waste stream (BAT 9)
2. **Output quality (BAT 10)**
3. Residues management plan
4. OTNOC management plan (BAT 18)
5. **Dust emissions from BA (BAT 23)**
6. Accident
7. Odour emissions
8. Noise (BAT 37)

BAT-C 1 – potential issues

Would be the ISO 14001 sufficient for BAT-c1 compliance?

BAT-C 1 provides a list of features that should be implemented in the Environmental Management System (EMS). EMAS, according to the note in BAT-C 1 would be an example of EMS compliant with BAT-c 1.

The EN ISO 14001 EMS requirements are an integral part of EMAS but does not cover some aspects, or have some as not mandatory (e.g. frequency of audits, employee involvement…)

Differences between EMAS and ISO 14001

	EMAS	ISO/EN ISO 14001
Preliminary environmental review	Verified initial review	No review
External communication and verification	Environmental policy, objectives, environmental management system and details of organisation's performance made public	Environmental policy made public
Audits	Frequency and methodology of audits of the environmental management system and of environmental performance	Audits of the environmental management system (frequency or methodology not specified)
Contractors and suppliers	Required influence over contractors and suppliers	Relevant procedures are communicated to contractors and suppliers
Commitments and requirements	Employee involvement, continuous improvement of environmental performance and compliance with environmental legislation	Commitment of continual improvement of the environmental management system rather than a demonstration of continual improvement of environmental performance

Proposal: implement the points not covered by the ISO 14001 – not necessarily EMAS

BAT-c 9 – Waste stream management plan

In order to improve the overall environmental performance of the incineration plant by waste stream management (see BAT 1), BAT is to use all of the techniques (a) to (c) given below, and, where relevant, also techniques (d), (e) and (f).

a) Determination of the types of waste that can be incinerated **(listed in the site permit)**
c) Set-up and implementation of waste characterization and pre-acceptance procedure (**for waste received other than municipal waste** (commercial wastes, ...))
d) Set-up and implementation of waste acceptance procedure (**for waste received other than municipal waste (commercial wastes**, ...)) **See BAT 11**
e) Set-up and implementation of a waste identification system and inventory of waste received (badging) at weighbridge (type, date and time of arrival, producer, tonnage received, etc.) for waste other than clinical waste

Modena

- List of waste codes accepted in the permit
- Characterisation of waste from non municipal waste producers
- Waste identification (badging) at weighbridge

Waste characterisation and pre-acceptance: approve all potential waste entering the facility through the dedicated office:In this phase the quantities and types of waste are analyzed, to check compatibility with the system in terms of waste code and hazard. For the most significant flows, some typical "technological" parameters for the waste-to-energy process are also verified: chlorine and sulfur content, humidity, metals
Spot analyzes are also carried out to confirm analytical reports of the producers.

Bologna

Clinical waste is stored in a different area of the bunker, and it is never mixed with the rest of the waste.

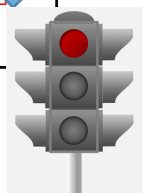
e) Waste segregation

Modena

BAT 18 – OTNOC management plan

The goal of the BAT-c is to set up and implement a risk-based OTNOC management plan	Applied technique	
Identification of potential OTNOC (e.g. failure of equipment critical to the protection of the environment ('critical equipment')), of their root causes and of their potential consequences, and regular review and update of the list of identified OTNOC following the periodic assessment below;	Yes ☐	No ☒
Correct design of the critical equipment to reduce the OTNOC (for example compartmentalisation of the bag filter or techniques to avoid the bypass of the bag filter during start-ups and shutdowns, ...)	Yes ☒ There is no bypass in the plant	No ☐
Preventive maintenance to limit incidents on critical processes (in connection with previous action plan)	Yes ☒	No ☐
Estimation of pollutant emissions during OTNOC phases not included in the EOT Effective Operating Time) phases (start-up and shutdown phases without waste incineration, emergency shutdowns); preventive action if necessary to limit these emissions **Linked to BAT 5**	Yes ☐	No ☒
Installation compliant with BAT-c 18 (if all the above answers are Yes)	**Yes ☐**	**No ☒**

Modena WtE plant does not have any OTNOC management plan at the moment



BAT 18 – OTNOC management plan

Planned action:

Implement a risk-based OTNOC management plan

Example:

Produce a document with the identification of potential OTNOC, root causes, potential consequences, signals to identify them.

List of the types of OTNOC

- Start-up operations (if no waste is being incinerated) ref. IED Annex VI part 8 1.2
- Start-up operations (with waste)
- shut-down operations (with waste)
- shut-down operations (if no waste is being incinerated) ref. IED Annex VI part 8 1.2
- Leaks (IED article 14.1.f)
- Malfunctions (IED article 14.1.f)
- Momentary stoppages (IED article 14.1.f)
- Definitive cessation of operations (IED article 14.1.f)
- Breakdown (IED article 47)
- Bypassing of abatement systems (Guidance)
- Regular maintenance (Guidance)
- Exceptional conditions (Guidance)

Annex 2.c of the Guidance document can be used

GUIDANCE document on IED-based (draft) Waste Incineration BREF and BAT conclusions

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ANNEX 2.c

Detection of OTNOCs related to emissions at stack by using control system signals

OTNOC management plan – Example 1/2

Annex 2.c

	Functional subset	Function / Element	Flow	Failures	Possible causes
1	Grid furnace	Incinerate / Combustion air	Tertiary air	Tertiary air loss	Fan or inverter failure
2	Grid furnace	Incinerate / Combustion air	Ventilation air of the burner (Facade of the furnace)	Burner malfunction	Fan failure
3	Grid furnace / Fluidised bed	Confine / Casing	Parasitic air	Loss sealing on casing of the furnace	Loss of seal on expansion joint Casing deterioration due to rising fire
4	Oscillating furnace	Confine	Parasitic air	Loss sealing	No water in the bottom ash extractor (loss of hydraulic guard) (failure of the float or water supply system, clogging of the pipe (accumulation of slag)) Poor closure of hopper trapdoors under post-combustion cell Sealing system (seal) between the fixed parts (pusher and post-combustion cell) and the rotating part

OTNOC management plan – Example 2/2

Annex 2.c

	Consequences	Feared consequences	Frequency	Type of OTNOC	Automatism detection means
1	Disruption of combustion -> CO production	Short duration CO exceedance between 2 and 10xELV	0,5 < < 2 times/year	Breakdown	Tertiary air fan shutdown (default)
2	Loss of a "tertiary" air supply favoring combustion -> CO, TOC production	Short duration CO exceedance between 2 and 10xELV	0,5 < < 2 times/year	Breakdown	O2 below threshold limit
3	Disruption of combustion -> production of CO, TOC + degradation of bottom ash quality + possibilities to exceed other pollutants due to poor stoichiometry + smoke velocity (compensation by extractor fan)	Short duration CO exceedance < 2xELV	0,1 < < 0,5 times/year	Malfunctions	O2 above threshold limit
4	Disruption of combustion -> CO and pollutants production	Short duration CO exceedance < 2xELV	0,5 < < 2 times/year	Malfunctions	O2 above threshold limit

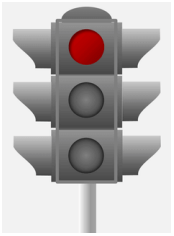
Annex 2.c of the E&G document provides a list of ca. 200 possible OTNOC and possible causes

BAT-c 18 + BAT-c 5 – monitoring channelled emissions during OTNOC

BAT-c 5 requires to monitor channelled emissions to air from the incineration plant during OTNOC and in particular:

- direct emission measurements (e.g. for the pollutants that are monitored continuously) or by monitoring of surrogate parameters (if this proves to be of equivalent or better scientific quality than direct emission measurements) and
- Measurement campaigns e.g. every 3 years for estimation of emissions during start-up and shutdown when no waste is being incinerated (including emissions of PCDD/F)

The Modena plant normally has 1 shutdown + startup / year
Ca. 1 month



Example of planned action:

Every three years, to organise a measurement campaign with a certified laboratory to estimate emissions during start-up and shutdown outside r-EOT

IED Annex VI already prescribes to respect IED ELVs in the relevant Effective Operating Time (EOT)

BAT-c 18 + BAT-c 5 – monitoring channelled emissions during OTNOC

Possible issues:

- Emissions can be measured only during planned OTNOC (in NR-EOT): e.g. Planned shutdown and startup
- Only continuous and semi-continuous measurements are possible during unplanned OTNOC
- Representativity of emissions at low flow
- The large variations of peripheral parameters (O_2), which are used to correct the raw readings to standard conditions

For the other OTNOC outside EOT, it would be difficult to make measurements, either because they are not planned or because they are situations where the plant is stopped

Questions:

- Do you have a OTNOC plan already implemented in your plant?
- Any experience with these issues?
- Possible solutions for implementation?

Section for receiving waste

Modena plant

1. Radioactivity control
2. Load vehicle weighing;
3. Document control (identification of the lender / transporter, form control);
4. Weight registration;
5. Start at the point of discharge into the pit (semaphore signaling of the access routes available);
6. Positioning of the vehicle and discharge of waste in a storage pit;
7. Unload vehicle weighing (tare);
8. Return of documents with proof of disposal;
9. Removal of the vehicle.

BAT 11. monitor the waste deliveries as part of the waste acceptance procedures (see BAT 9 c) including, depending on the risk posed by the incoming waste, the elements given below:

	Applied technique	
Radioactivity detection	Yes ☒	No ☐
Weighing of the waste deliveries	Yes ☒	No ☐
Visual inspection of the wastes received in the bunker (for example through the control room window, a video surveillance, ...)	Yes ☒	No ☐
Analysis (for example annually) of a sample of received waste : **NCV**, content of halogens and metals/metalloids	Yes ☒	No ☐
Installation compliant with BAT-c 11 (if all the above answers are Yes or not applicable ticked)	**Yes** ☒	**No** ☐

Bologna: Additionally to check on clinical waste:

Radioactivity detection	Yes ☒	No ☐
Weighing of the waste deliveries	Yes ☒	No ☐

Bologna has a small input of clinical waste

BAT 11. monitor the waste deliveries as part of the waste acceptance procedures (see BAT 9 c) including, depending on the risk posed by the incoming waste, the elements given below:

Possible issue:

Radioactivity detection

- Cost of the radioactivity detection ?
- How to assess the risk when the instrument is not installed?

Possible proposal:
Periodic analysis of radioactivity of the incoming waste to assess the risk posed by it.

Modena plant

BAT 12. Handling and storage of waste

	Applied technique	
Impermeable surfaces with an adequate drainage infrastructure		
a) Receipt / storage of solid waste (excluding clinical waste) in a sealed bunker (concrete)	Yes ☒	No ☐
a) Receipt / storage of sewage sludge in closed silo (waterproof) or in sealed concrete or metal bunker or direct supply via pipeline from the producer Not applicable (no sewage sludge treated)	Yes ☐ ☒	No ☐
a) Regular verification (for example annually) of the sealing of these surfaces / storage in bunker where possible or presence of upstream / downstream piezometers, the monitoring of which showing the absence of pollution / leakage	Yes ☒ Regular verification during maintenance	No ☐
Adequate waste storage capacity e.g.		
b) Check maximum volume storage of the bunker (stacking included) vs treatment capacity input flow	Yes ☒	No ☐

Bologna: Additionally to check on clinical waste:
b) for wastes that are not mixed during storage (e.g. clinical waste, packed waste), the maximum residence time is clearly established. **MAX residence time: 2 days**

Section for storage and feeding waste

1. Discharge of the waste of the vehicle in the bunker (about 16 m high);
2. Mixing and homogenisation of the waste with an octopus crane;
3. From the storage bunker the waste is fed into the loading hopper by bridge crane;
4. The loading hopper is always kept full to avoid backfires;
5. The bunker is maintained in depression and the extracted air is used as primary combustion air.

Modena plant

Energy efficiency

Relevant BATs: 2 – 19 – 20

BAT 2: Calculation of energy efficiency: requires the monitoring of energy efficiency of the plant or of a part of it *una tantum* (and after each modification that could significantly affect energy efficiency).

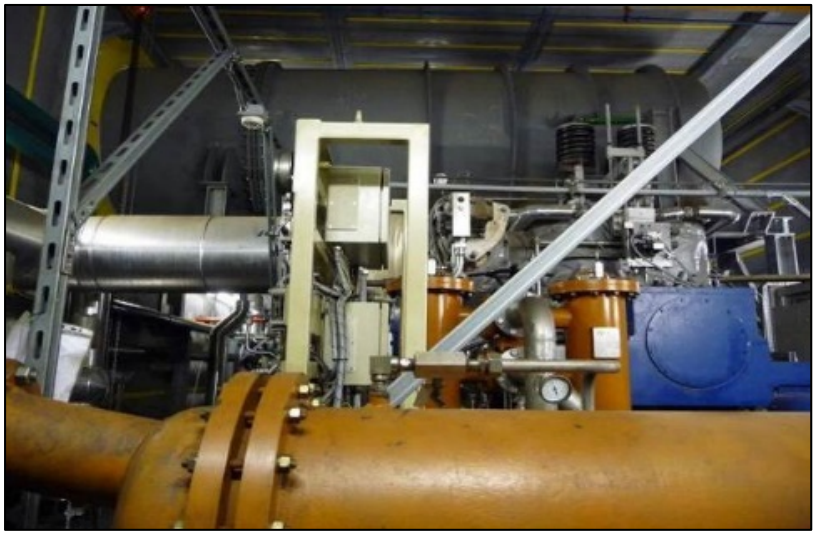
For existing plants, existing (if available) performance tests on the relevant pieces of equipment (e.g. boiler, turbine) and nominal design values at performance test conditions for the other parts.

Either Gross Electrical Efficiency or Gross Energy Efficiency is usually calculated

Performance test:

Electricity only plant:

- Gross electrical efficiency



Modena plant

Energy efficiency - 2

BAT-c 19

All treatment lines are equipped with an energy recovery boiler	Yes ☒	No ☐

Formula for the calculation of energy efficiency

Power output to thermal input ratio

Correction factor to take into account the internal use of heat

$$\eta\downarrow e = W\downarrow e / Q\downarrow th \times (Q\downarrow b / (Q\downarrow b - Q\downarrow i))$$

$W\downarrow e$: *electrical power generated, in MW;*

$Q\downarrow th$: *thermal input to the thermal treatment units (e.g. furnaces), including the waste and auxiliary fuels that are used continuously (excluding for example for start-up), in MWth expressed as the lower heating value.*

$Q\downarrow b$: *thermal power produced by the boiler, in MW;*

$Q\downarrow i$: *thermal power (as steam or hot water) that is used internally (e.g. for flue-gas reheating), in MW;*

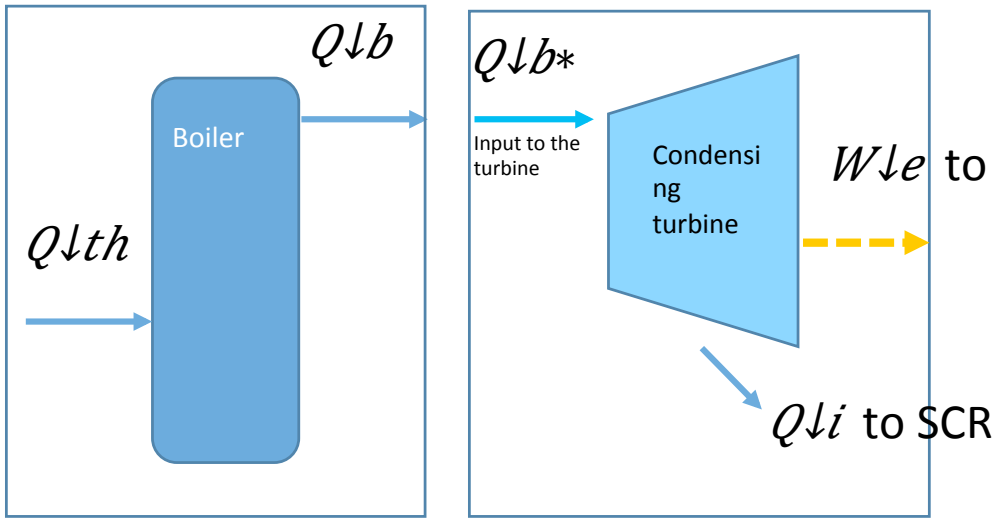
Applies to electricity oriented plants:

- Electricity only plant
- CHP plants able to expand all the steam in the condensing turbine

Qi should not take into account the heat that is used internally when it result in an energy used in the production of steam/hot water by the boilers

BAT-AEEL (%)				
Plant	**Municipal solid waste, other non-hazardous waste and hazardous wood waste**		**Hazardous waste other than hazardous wood waste (1)**	**Sewage sludge**
	Gross electrical efficiency (2) (3)	**Gross energy efficiency (4)**	**Boiler efficiency**	
New plant	25–35	72–91 (5)	60–80	60–70 (6)
Existing plant	20–35			

Energy efficiency



BAT-c 20

BATAEEL (%)
20-35

<u>From the performance test document:</u>

Turbine

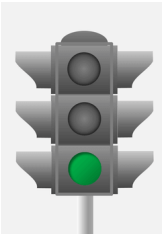
- **Turbine power output: 16,9 MW**
- Thermal power that is used internally (SCR heat exchanger): **1,69 MWth (from a bleed)**

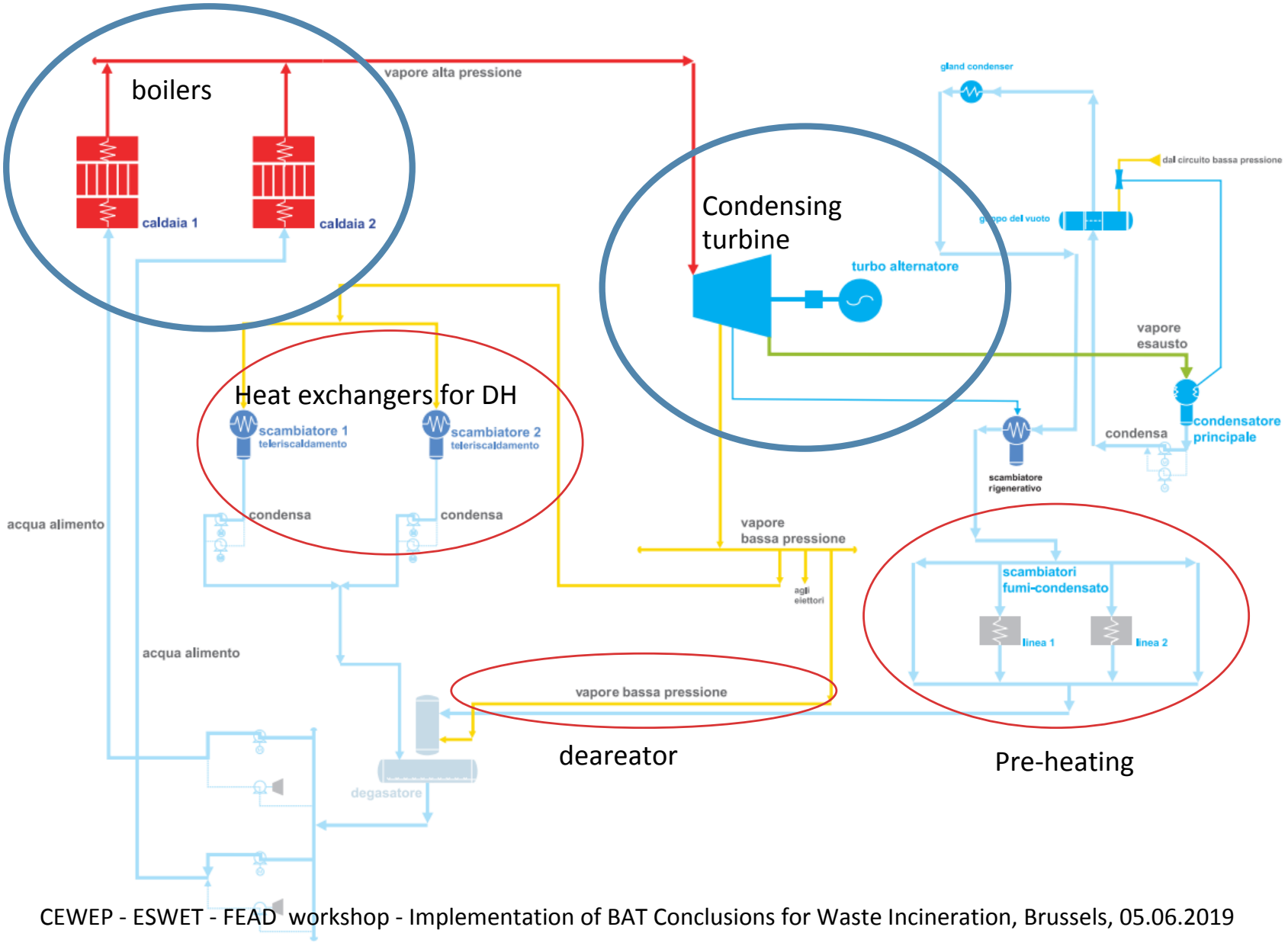
Boiler

- NCV: 10,3 MJ/kg
- Waste feed: 7,5 kg/s
- **Thermal input: 77,25 MW**
- **Boiler output: 73,81 MWth**

$$\eta\downarrow e = 16{,}9/77{,}25 \times (73{,}81/73{,}81 - 1{,}69) = \mathbf{22{,}38}\%$$

Modena plant




boilers
vapore alta pressione
caldaia 1
caldaia 2
Condensing turbines
turbo alternatore
gland condenser
dal circuito bassa pressione
vapore esausto
condensatore principale
condensa
scambiatore rigenerativo
Heat exchangers for DH
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scambiatore 2 teleriscaldamento
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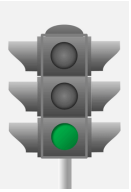
Pre-heating

Energy efficiency Modena plant



BAT-c 20 also states that: In order to increase the energy efficiency, BAT is to use an appropriate combination of the techniques given below:

a) Drying of sewage sludge *Not applicable (no sewage sludge treated)*	Yes ☐ ☒	No ☒
b) Optimization (via control-command) of primary and secondary air flow rates to reduce flue gas flow	Yes ☒	No ☐
b) et c) Flue-gas recirculation	Yes ☐	No ☒
c) Use of integral furnace-boilers	Yes ☒	No ☐
c) Thermal insulation of furnaces and boilers	Yes ☒	No ☐
c) et i) Recovery of heat from the cooling of slags and bottom ashes (dry extractors)	Yes ☐	No ☒
d) Optimization of boiler design (flue gas velocities and distribution, water / steam circulation, convective walls, ...)	Yes ☒	No ☐
d) On-line and off-line (during maintenance stoppages) boiler cleaning systems.	Yes ☒	No ☐
e) Low temperature flue gas heat exchangers (outside boilers) installed on the course of the FGC system	Yes ☒	No ☐
f) High steam conditions (more than 45 bars abs, 400 °C). Applicable only if electricity production. 49 bar 450 °C	Yes ☒	No ☐
g) Cogeneration: electricity production + sale of heat (in steam or hot water form)	Yes ☐	No ☒
h) Final flue gas condenser at the end of the FGC system (to recover the vaporization energy of the water contained in the fumes)	Yes ☐	No ☒
Installation compliant with BAT-c 20 (if the above answers indicate a combination of techniques to achieve an appropriate energy efficiency with respect to BATAEEL (see table below)	**Yes ☒**	**No ☐**

Energy efficiency

Possible issues:

1) BATAEELs cannot be met in the plant without a major retrofit

- If the IED requires (see Article 15.3) permit conditions to ensure that emissions do not exceed BATAEL-values, the IED does not mention BATAEELs and does not require that energy efficiencies reach BATAEEL values. Article 11, which provides the *"General principles governing the basic obligations of the operator"*, only requests that *"energy is used efficiently*".

Therefore, if the installation energy efficiency is lower than the relevant BATAEEL lower end, the operator must investigate how to improve the efficiency and do what he can to achieve this goal. However, he cannot have an obligation to achieve results if this is outside his control.

Especially considering that the techniques listed under BAT20 are common techniques to improve energy efficiency, but not necessarily to improve the efficiency as it is calculated in the BAT conclusions

Energy efficiency

Possible issues:

2) There is no performance test available

According to BAT-c 2:

«In the case of an existing incineration plant that has not carried out a performance test, or where a performance test at full load cannot be carried out for technical reasons, the gross electrical efficiency, the gross energy efficiency, or the boiler efficiency can be determined taking into account the design values at performance test conditions.»

There is no reason to take a performance test just to demonstrate the compliance with this BAT-c.

proposal: **use design values instead**

3) How to define a 'modification of an existing incineration plant that could significantly affect the energy efficiency'?

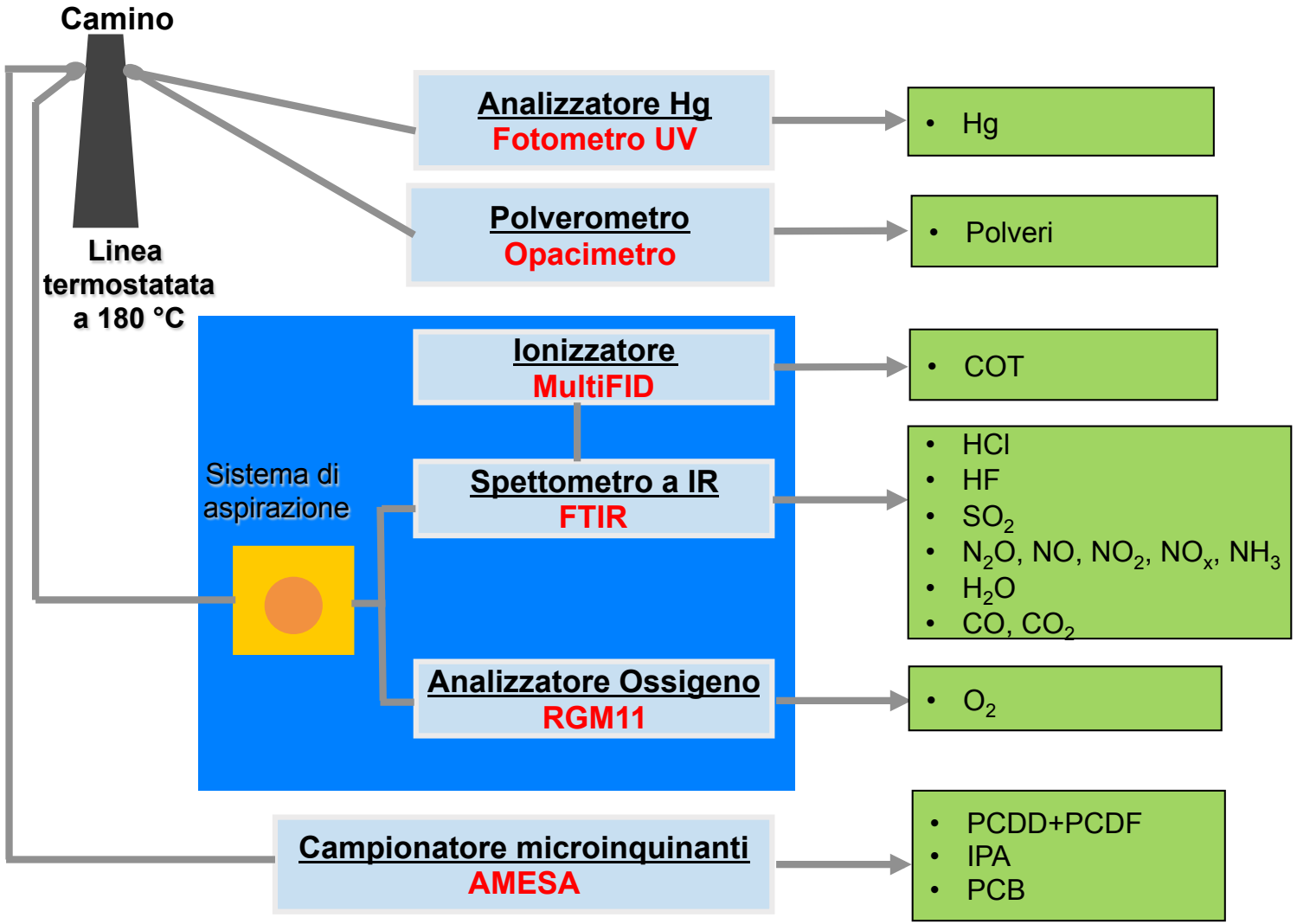
4) Special cases

It is not possible to calculate the efficiency of this **entire** plant through either the formula of Gross electrical efficiency or the Gross energy efficiency.

See annex 4 for proposal **Any example of such special cases???**

Modena plant

Emissions to air



Emissions to air

Modena plant

BAT-c 3 – key process parameters to monitor

	Applied technique	
Continuous measurement on flue-gas from the incineration of waste:		
- flow	Yes ☒	No ☐
- oxygen content	Yes ☒	No ☐
- temperature	Yes ☒	No ☐
- pressure	Yes ☒	No ☐
- water vapour content	Yes ☒	No ☐
Combustion chamber temperature, continuous measurement (T2s)	Yes ☒	No ☐
Waste water **from wet FGC**, continuous measurement / Waste water from bottom ash treatment plants	☐	
- flow	Yes ☒	No ☐
- pH	Yes ☒	No ☐
- temperature	Yes ☒	No ☐
Installation compliant with BAT-c 3	Yes ☐	No ☐

Bologna plant has flow, pH and temperature measurement for water coming from the wet FGC system

Not applicable to Modena Dry FGC system

Emissions to air

BAT-c 4 – Monitoring channelled emissions to air

Continuous measurement at the stack (flue gas):		
- NOx	Yes ☒	No ☐
- **NH_3**	Yes ☒	No ☐
Not applicable (neither SNCR nor SCR)	☐	
- CO	Yes ☒	No ☐
- SO_2	Yes ☒	No ☐
- HCl	Yes ☒	No ☐
- HF	Yes ☒	No ☐
(or exemption in the permit)	☐	
- Dust	Yes ☒	No ☐
- **Hg (mercury)**	Yes ☒	No ☐
Not applicable (low & stable mercury content proven in the waste incinerated)	☐	
- TVOC	Yes ☒	No ☐

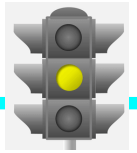
Emissions to air

Periodic measurement at the stack (flue gas):		
- **N_2O ; once a year minimum (Continuous)**	Yes ☒	No ☐
Not applicable (no use of urea for SNCR and no fluidised bed furnace)	☐	
- Metals and metalloids (As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Tl, V) ; each 6 month at least 2/month	Yes ☒	No ☐
- **PBDD/F (brominated dioxins and furans) ; each 6 month at least** The monitoring only applies to the incineration of waste containing brominated flame retardants or to plants using BAT-c 31 d with continuous injection of bromine.	Yes ☐	No ☐ TEF incoming
- PCDD/F (dioxins and furans) ; each 6 month at least	Yes ☒	No ☐
- Dioxin-like PCBs ; every 6 month at least	Yes ☒	No ☐
Not applicable (emissions < 0,01 ng WHO-TEQ/Nm^3 proven; see below long term sampling)	☐	
- **Benzo[a]pyrène ; 1 per year minimum**	Yes ☒	No ☐
- Hg	Yes ☒	No ☐

Emissions to air

Long term sampling (stack emissions), one per month at least: - PCDD/F (dioxins and furans) Not applicable (emissions levels are proven to be sufficiently stable) - Dioxin-like PCBs Not applicable (emissions < 0,01 ng WHO-TEQ/Nm^3 proven)	Yes ☒ Yes ☒ ☐	No ☐ No ☐
Installation compliant with BAT-c 4 (if all the above answers are Yes or not applicable ticked for points 2, 8, 10, 12, 14 and 17) NB: the technique relating to possible dust measurements on the air extracted from dusty areas of the bottom ash treatment is dealt with in the form for IBA treatment facilities (see Annex 6.b)	**Yes** ☒	**No** ☐

The only pollutant currently not monitored in the plant is PBDD/F.



Possible issues:

1) PBDD/F

brominated dioxins and furans; each 6 month at least

The monitoring only applies to the incineration of waste containing brominated flame retardants or to plants using BAT-c 31 d with continuous injection of bromine.

Flame retardants are present in municipal waste, however in small quantities.

NO standard method for the measurement at the moment,

Questions:

- **Any experience with measurement of PBDD/F?**
- **Possible solutions for implementation?**

2) Others: Benzo[a]pyrene, N_2O

Possible issues:

3) PCDD/F and PCB-dL

- According to footnote 7 to BAT-c 4 associated table, the long-term sampling monitoring *"does not apply if the emission levels are proven to be sufficiently stable"* for PCDD/F on one hand and for PCB-DL on the other hand. In such cases, short term sampling is requested every 6 months for PCDD/F as well as for PCB-DL. However, even the short term sampling does not apply to PCB-DL if the emissions *"are proven to be less than 0.01 ng $_{WHO\text{-}TEQ}/Nm^3$"*
- It is proposed to consider that PCDD/F emissions are stable if over 1 year the periodic/continuous sampling result values do not vary more than in a range of 0.03 ng $_{I\text{-}TEQ}/Nm^3$ and that PCB-DL emissions are stable if over 1 year the continuous sampling result values do not vary more than in a range of 0.02 ng $_{WHO\text{-}TEQ}/Nm^3$.

Question:
Any other ideas or experience in regards of the continuous sampling of PCDD/F (+ dl-PCBs)?

Possible issues:

4) Mercury

BAT 4:

"For plants incinerating wastes with a proven low and stable mercury content (…), the continuous monitoring of emissions may be replaced by long-term sampling or periodic measurements with a minimum frequency of once every six months."

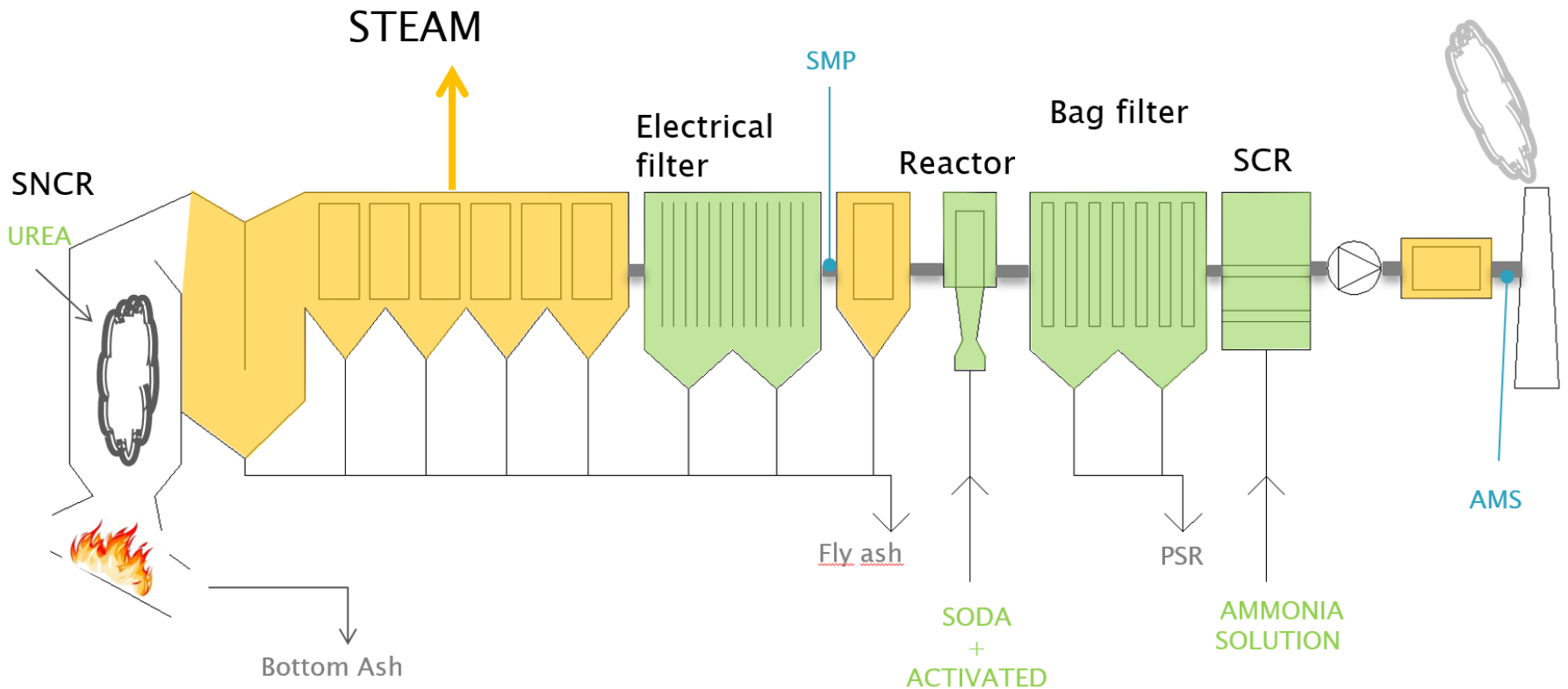
Note 2 associated to BAT-c 32 says that this lower end of the BATAEL range (5 µg/ Nm^3) may be achieved "*when incinerating wastes with a proven low and stable mercury content, (e.g. monostreams of waste of a controlled composition)*".

The criterium above correlates low and stable mercury content to low emissions of mercury.

Proposal for identification of waste with low and stable mercury content: 6 successive short term sampling results do not exceed 5 µg/Nm^3, which is the lower end of the BATAEL range for continuous monitoring and average over the short term sampling period.

Emissions to air

To reduce channelled emissions of dust, metals and metalloids, HCl, HF, SO2, NOx, N2O, CO, NH3, organic compounds and mercury several techniques are listed in BAT-c 25-27-28-29-30-31. The Modena plant is equipped with the following FGC system:



Dry flue gas cleaning system

Modena plant

Assessment of compliance of BATAELs

BATAELs – Compliance check in NOC

IED Article 15.3 requires that emissions do not exceed BATAEL values in NOC. However, up to now, the operators have no indication provided by the control system telling if the line is in NOC or in OTNOC.

In order to assess if the emissions of an existing line do not exceed the BATAELs, it is proposed* to check the emissions over the 3 last years (or over the available years for recent plants), with these 2 options:

- **Analytical method: to check for each continuously monitored substance if all the daily average values do not exceed the BATAEL upped end. If some do, check if the corresponding ½-hr values are in an OTNOC (R-EOT), and, in such case, exclude them and recalculate the daily average on the basis of the NOC ½-hr values (if at least 43).**
- **Statistical method: to check for each continuously monitored substance if the 97th -98th – 99th centile of the valid daily averages over this period of time do not exceed the BATAEL upper end. (The assumption being made here is that OTNOC situations do not occur more than in 2% of the days)**

(*) These proposals are *de facto* an application of IED Article 15.3(b). See the drawing about Article 15,3(a) and 15,3(b) at the end of session 5

WI BREF draft BATAELs vs. IED Annex VI daily continuous ELVs - 1/2

Air emission at stack		IED Annex VI daily and periodic ELVs			BATAELs (WI BREF draft 12/2018)		
Substance	Unit (11% O_2, dry)	IED ELV	Max. Conf. interval [1]	Sampling period	NEW plants	EXISTING plants	Sampling period
Dust	mg/Nm^3	10	3	Daily	**<2-5**		Daily
TVOC	mg/Nm^3	10	3	Daily	**<3-10**		Daily
CO	mg/Nm^3	50			**10-50**		Daily
HCl	mg/Nm^3	10	4	Daily	**<2-6**	**<2-8**	Daily
HF	mg/Nm^3	1	0,4	Daily	**<1**		Daily [2]
SO_2	mg/Nm^3	50	10	Daily	**5-30**	**5-40**	Daily
NO_x (SCR, SNCR…)	mg/Nm^3	200	40	Daily	**50-120**	**50-150**	Daily
SNCR, if SCR not possible						**up to 180**	
NH_3 (SCR or SNCR) (Exist. SNCR not wet)	mg/Nm^3				**2-10**	**2-10 (15)**	Daily
Hg	µg/Nm^3	50		Periodic, short term	**<5-20**		Daily [3, 4]
					1-10		Long term sampling [3]
					<5-20		Periodic, short term [3]

(1): According to IED Annex VI, Part 8, Section 1.2, the value of the confidence interval should be subtracted from the measured values to determine the half-hourly average values and then the daily average values.
(2): HF continuous measurement may be replaced by periodic measurements if HCl emission are proven to be sufficiently stable.
(3): Hg continuous measurement may be replaced by long-term sampling or periodic measurements if incinerated waste Hg content proven low and stable (e.g. mono-streams of waste of a controlled composition).
(4): Hg ½_hr average indicative value (not BATAELs) for new plants 15-35 µg/Nm^3, for existing 15-40 µg/Nm^3.

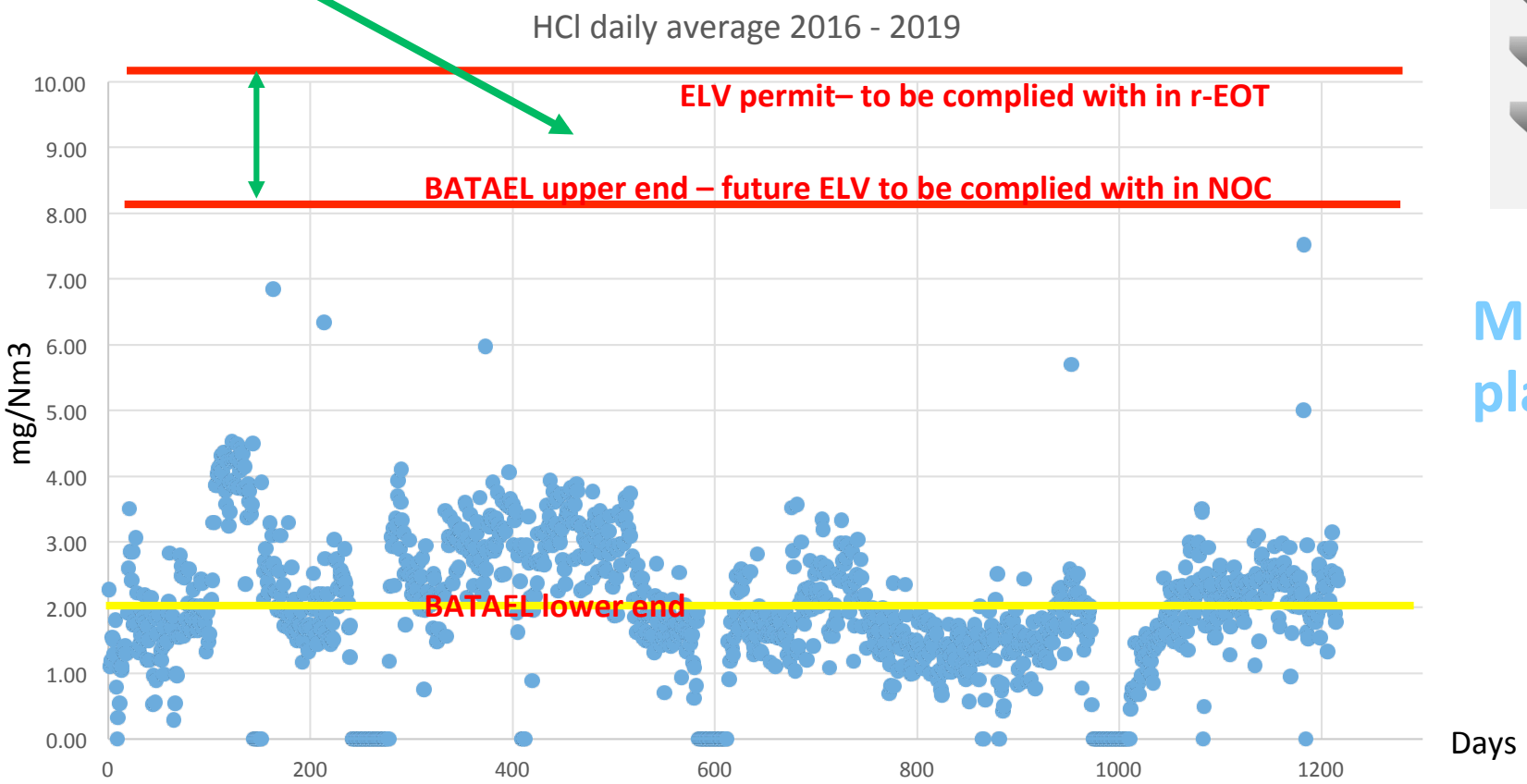
WI BREF draft BATAELs vs. IED Annex VI daily continuous ELVs - 2/2

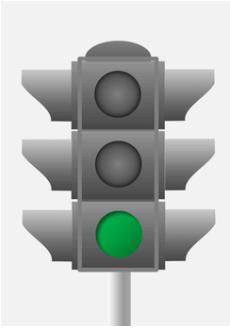
Air emission at stack		IED Annex VI daily and periodic ELVs			BATAELs (WI BREF draft 12/2018)		
Substance	**Unit (11% O_2, dry)**	**IED ELV**	**Max Conf. interval [1]**	**Sampling period**	**NEW plants**	**EXISTING plants**	**Sampling period**
PCDD/F [5]	ng $_{I\text{-}TEQ}/Nm^3$				**<0.01-0.06**	**<0.01-0.08**	Long term sampling [6]
PCDD/F + PCB-DL [5]	ng $_{I \& WHO\text{-}TEQ}/Nm^3$				**<0.01-0.08**	**<0.01-0.1**	
PCDD/F [5]	ng $_{I\text{-}TEQ}/Nm^3$	0.1		Periodic, short term	**<0.01-0.04**	**<0.01-0.06**	Periodic, short term
PCDD/F + PCB-DL [5]	ng $_{I \& WHO\text{-}TEQ}/Nm^3$			Periodic, short term	**<0.01-0.06**	**<0.01-0.08**	
Cd+Tl	mg/Nm^3	0.05		Periodic, short term	**0.005 - 0.02**		Periodic, short term
Sb+As+Pb+Cr+ Co+Cu+Mn+Ni +V	mg/Nm^3	0.5		Periodic, short term	**0.01-0.3**		Periodic, short term

(5): Either the BATAELs for PCDD/F or the BATAELs for PCDD/F + PCBs-DL apply. PCB-DL monitoring does not apply if PCB-DL are proven to be less than 0.01 ng $_{WHO\text{-}TEQ}/Nm^3$.
(6): The long term sampling BATAELs do not apply if the emission levels are proven to be sufficiently stable.

Example 1: HCl

No daily average between these 2 levels

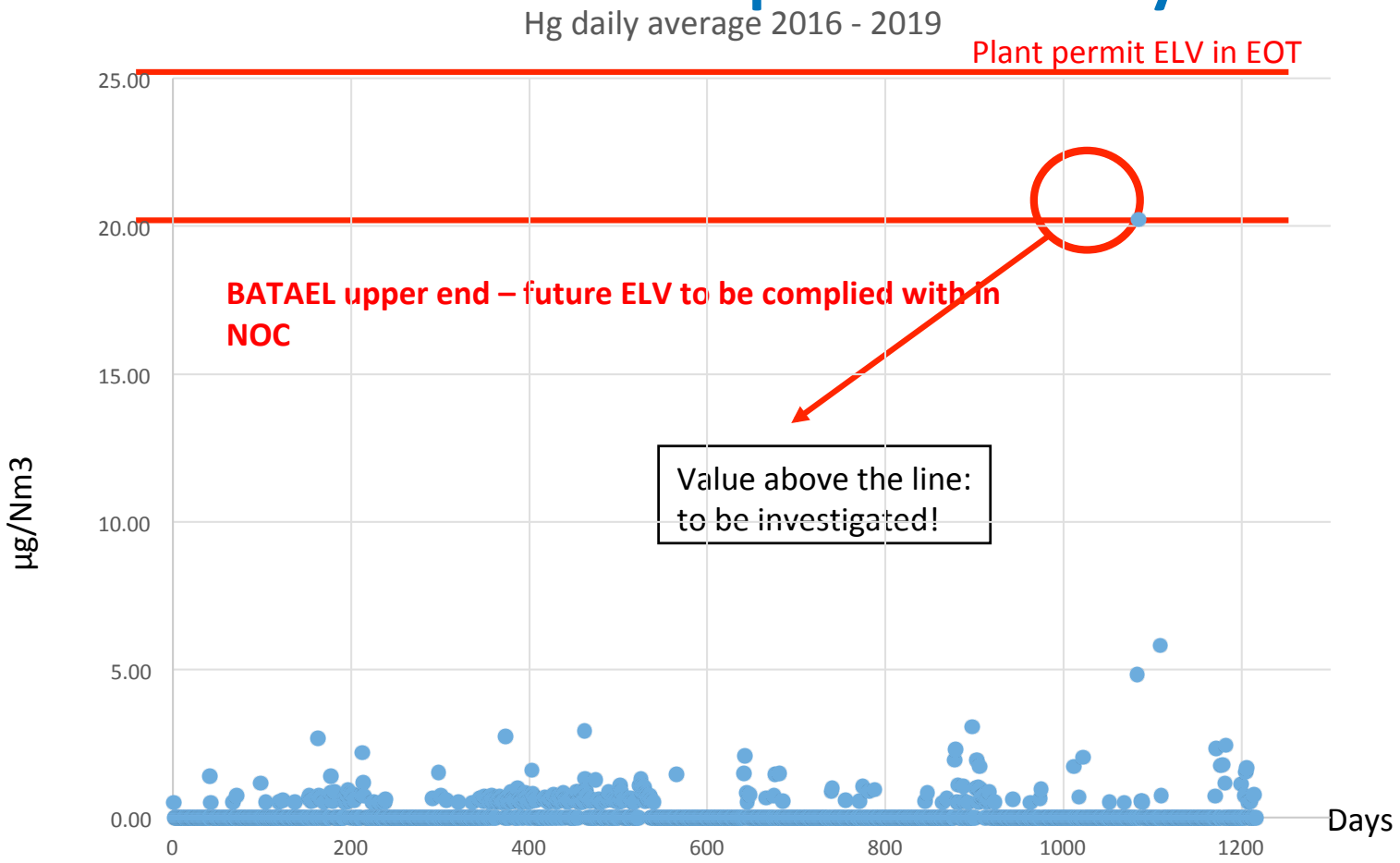


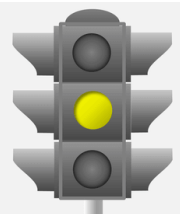


Modena plant

Example of use of the analytical method. All the daily averages are below the upper end of the BATAEL. The plant is fully able to comply with the future BATAEL-based ELV in NOC at the level of the upper end.

Example 2: Mercury





Modena plant

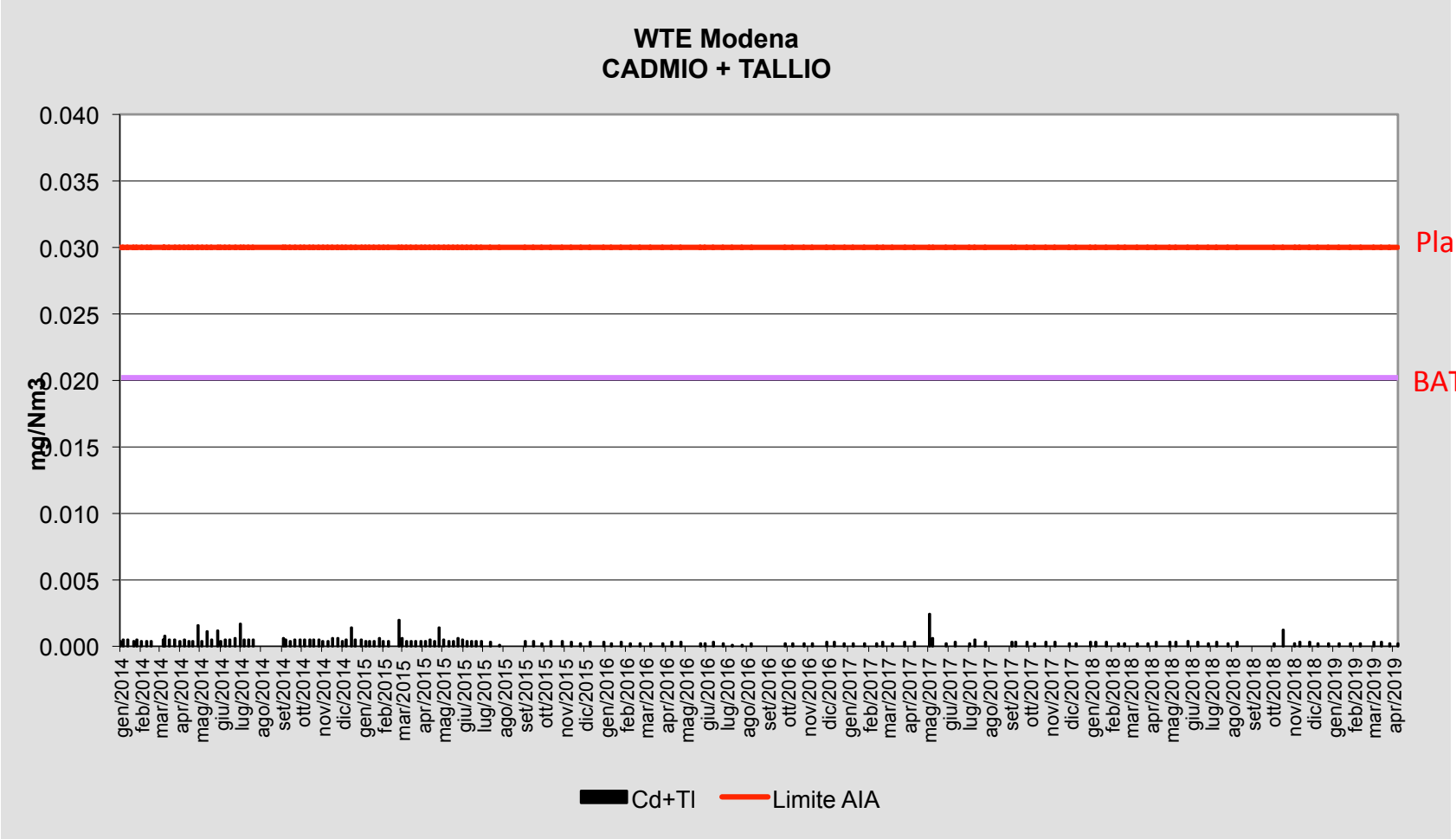
Example of use of the analytical method. All the daily averages except one are below the upper end of the BATAEL.

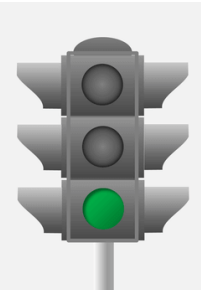
The value above the line is due to a start-up (OTNOC situation, but r-EOT). This therefore can be excluded from the analysis.

Example 3: Cadmium + Tallium

Modena plant

Periodic measurement





Example of use of the analytical method. All the values are below the ELV.

CEWEP workshop - Implementation of BAT Conclusions for Waste Incineration, Brussels, 05.06.2019

Possible issues:

1) Measurement uncertainty issue: how the uncertainty is calculated?

Impianto Linea n. **4**	**Termovalorizzatore di Modena (MO)**
D a t a inserimento: **29/01/2019**	Report QAL2 n. **18/349/00** del **18/12/2018**

Sistema di Monitoraggio in continuo delle Emissioni – PRINCIPALE

Parametro	Coeff. angolare	Intercetta	Range di validità	Intervallo di confidenza assoluto	U.M.
CO_2	0,96	0,00	0 – 10,45	0,38	% (v/v)
SO_2	0,97	0,36	0 – 63,02	0,54	mg/Nm^3
HCl	1,09	-0,49	0 – 10,90	0,98	mg/Nm^3
HF	0,83	0,09	0 – 1,03	0,02	mg/Nm^3
NH_3	1,01	-0,09	0 – 8,93	0,67	mg/Nm^3
COT	1,01	0,22	0 – 12,66	1,04	mg/Nm^3
CO	0,98	0,76	0 – 39,19	2,64	mg/Nm^3
NO_x	1,02	1,55	0 – 141,61	8,63	mg/Nm^3
N_2O	0,92	0,16	0 – 10,27	0,67	mg/Nm^3
H_2O (*)	0,95	0,00	0 – 18,77	0,86	%(v/v)
O_2 (*)	0,97	0,43	0 – 21,85	0,93	%(v/v)

Sistema di Monitoraggio in continuo delle Emissioni – BACKUP

Osservazioni:

$$Sld = Ps * ELV / 1{,}96$$

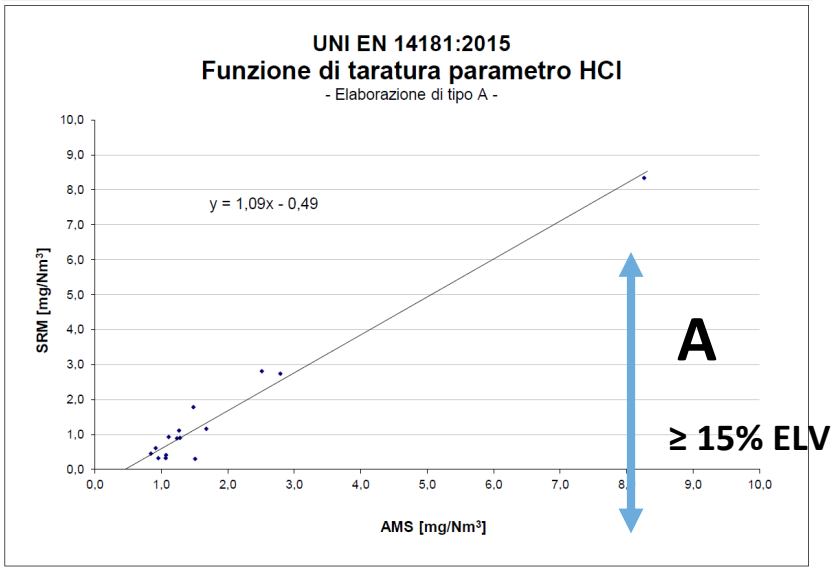
Ps is the percentage calculated sperimentally during QAL2

Modena plant

QAL 2 - HCl

HERAmbiente S.p.A. Via Alessandro Cavazza, 45 (MO) 41100 - Modena	Parametro: **HCl**	Elaborazioni effettuate secondo: **UNI EN 14181:2015**

CAMPIONAMENTO		SISTEMA DI RIFERIMENTO (SRM)						SISTEMA AUTOMATICO DI MISURA (AMS)							SCOSTAMENTO	
Data e ora inizio campionamento:	Durata (minuti)	y_I (mg/Nm^3)	T °C	P mbar	H_2O %(v/v)	O_2 %(v/v)	$y_{I,s,rif}$ (mg/Nm$^3_{s,rif}$)	x_I (mg/Nm^3)	$\hat{y}_I$ (mg/Nm^3)	T °C	P mbar	H_2O %(v/v)	O_2 %(v/v)	$\hat{y}_{I,s,rif}$ (mg/Nm$^3_{s,rif}$)	D_I (mg/Nm$^3_{s,rif}$)	$(D_I-D_{medio})^2$ (mg/Nm$^3_{s,rif}$)^2
15/10/2018 17.36	30	0,61	0,00	1013,25	15,95	10,24	0,67	0,91	0,51	0,00	1013,25	16,25	10,41	0,57	0,10	0,00
16/10/2018 07.47	30	0,41	0,00	1013,25	15,30	11,08	0,49	1,07	0,68	0,00	1013,25	15,65	10,94	0,80	-0,31	0,15
16/10/2018 09.49	30	0,30	0,00	1013,25	15,70	10,83	0,35	1,51	1,15	0,00	1013,25	16,28	10,57	1,32	-0,97	1,10
16/10/2018 10.50	30	1,16	0,00	1013,25	15,23	11,17	1,39	1,68	1,34	0,00	1013,25	15,86	10,97	1,59	-0,20	0,08
16/10/2018 12.43	30	2,74	0,00	1013,25	13,44	11,19	3,23	2,79	2,55	0,00	1013,25	15,00	10,58	2,88	0,35	0,07
16/10/2018 13.44	30	2,81	0,00	1013,25	14,45	11,53	3,47	2,51	2,25	0,00	1013,25	15,47	10,62	2,56	0,91	0,69
16/10/2018 14.50	30	8,34	0,00	1013,25	14,85	11,89	10,75	8,26	8,52	0,00	1013,25	15,18	10,87	9,91	0,84	0,58
17/10/2018 07.40	30	0,32	0,00	1013,25	14,52	9,94	0,34	1,07	0,67	0,00	1013,25	15,19	10,60	0,76	-0,42	0,25
17/10/2018 08.41	30	0,93	0,00	1013,25	14,81	10,23	1,01	1,11	0,72	0,00	1013,25	15,51	10,42	0,81	0,20	0,01
17/10/2018 09.42	30	0,90	0,00	1013,25	15,20	10,17	0,98	1,28	0,91	0,00	1013,25	16,46	10,27	1,01	-0,03	0,01
17/10/2018 10.43	30	0,89	0,00	1013,25	16,48	10,99	1,06	1,24	0,86	0,00	1013,25	17,06	10,43	0,98	0,08	0,00
17/10/2018 12.42	30	0,32	0,00	1013,25	14,68	10,11	0,34	0,96	0,55	0,00	1013,25	15,92	10,48	0,62	-0,28	0,13
17/10/2018 13.43	30	0,45	0,00	1013,25	12,87	10,64	0,50	0,85	0,43	0,00	1013,25	14,33	10,69	0,49	0,01	0,00
18/10/2018 07.23	30	1,78	0,00	1013,25	15,47	10,43	1,99	1,48	1,13	0,00	1013,25	16,35	10,70	1,31	0,68	0,36
18/10/2018 08.24	30	1,11	0,00	1013,25	15,21	10,76	1,28	1,27	0,89	0,00	1013,25	16,70	10,74	1,05	0,23	0,02



1)Differences between AMS and SRM values, corrected to 11% oxygen

2)Calculate the standard deviation

3) $$S_D = \frac{P_s \cdot E}{1,96}$$ → P_s

Modena plant

Possible issues:

Issues:

- Uncertainty values calculated with QAL2 are low
- This method does not take into account the uncertainty of the SRM when calibrating the AMS

IED 2010/75/EU, Annex VI:

"The half-hourly average values and the 10-minute averages shall be determined within the effective operating time (excluding the start-up and shut-down periods if no waste is being incinerated) from the measured values after having subtracted the value of the confidence interval specified in point 1.3 of Part 6."

Transposition to the italian law: (D.lgs. 46/2014)

"The average values over 30 minutes and the average values over 10 minutes are determined during the effective operating time (excluding the start and stop periods if no waste is incinerated) based on the measured values, after subtraction of the respective value of the 95% confidence interval ***found experimentally."***

Questions:

- Is this a common method (from QAL2) to calculate the 95% confidence interval to be subtracted?
- Should the uncertainty be subtracted also when checking compliance with BATAELs-based ELVs?
- Is the uncertainty an absolute value to be subtracted sistematically or a percentage of the measured value?
- This absolute (or relative) value, could be the maximum expressed by the IED Annex VI?

Validity of measured values:

Average half-hourly and 10-minutes average are considered valid if:

- In the relevant period at least 70% of the values are valid
- Results are inside the calibration range

A daily average is calculated from the valid half-hourly averages and it is not valid if:

- More than 5 half-hourly averages are missing due to malfunction of the monitoring system Cfr. 152/2006 – italian decree
- The plant operates in **Normal Operating Condition** for less than 6 hours in a day.

4/60 hours for exceeding the half-hourly averages are counted for the calculation of daily average. Mercury is included in the calculation of the 60 hours.

If one half-hourly value is below the detection limit, for the calculation of the daily average it is used a value equal to half of the detection limit iself.

Possible issues:

2) Valid half-hourly and daily averages

IED Annex VI clarify that the 95% confidence interval is subtracted from the half-hourly values measured, which are then valid: "The daily average values shall be determined from those validated average values."

Definition from BAT conclusions:

Valid half-hourly average	A half-hourly average is considered valid when there is no maintenance or malfunction of the automated measuring system.
Daily average	Average over a period of one day based on valid half-hourly averages

⇨ NOC ?

RISK:

No mention to the subtraction of uncertainty

No mention to the 4/60 hours derogation of IED Annex VI

Question: Is the discussion on this topic already started in your country?

Bottom Ash handling, storage and treatment

The plant does not include a treatment facility for bottom ash. Bottom ash are wet-discharged on site and stored in a bunker, from which are then brought to another facility.

BAT-c 7 monitor the content of unburnt substances in slags and bottom ashes at the incineration plant

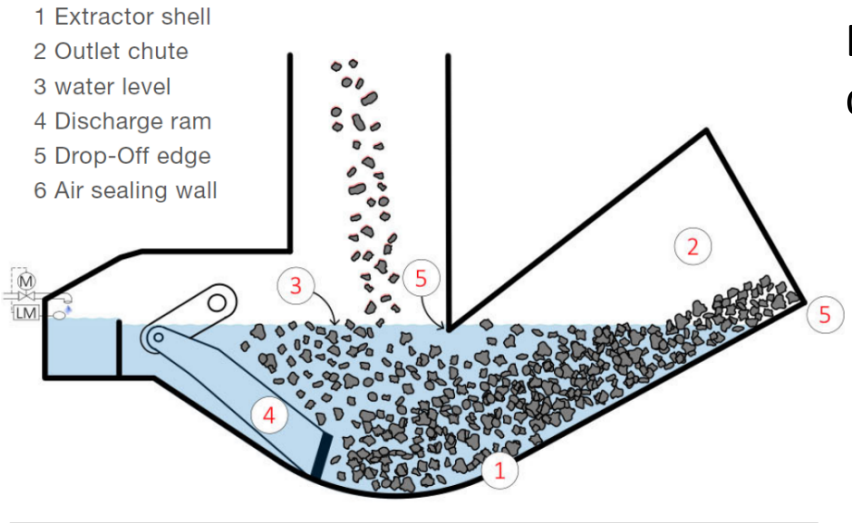
	Applied technique	
Measure at least every 3 months of the loss on ignition	Yes ☒	No ☐
Measure at least every 3 months of TOC	Yes ☐	No ☐
Installation compliant with BAT-c 7 (if at least one of the answers above is Yes)	**Yes ☒**	**No ☐**

BAT-c 14

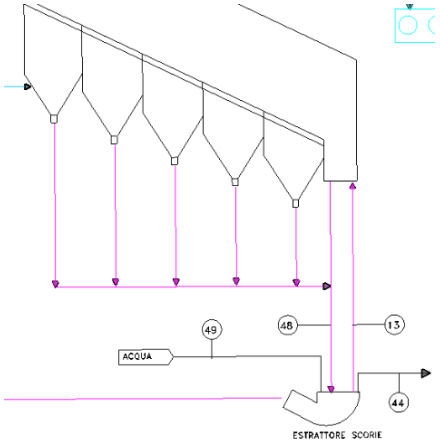
Parameter	Unit	BAT-AEPL
TOC content in slags and bottom ashes (1)	Dry wt-%	1–3 (2)
Loss on ignition of slags and bottom ashes (1)	Dry wt-%	1–5 (2)

(1) Either the BAT-AEPL for TOC content or the BAT-AEPL for the loss on ignition applies.
(2) The lower end of the BAT-AEPL range can be achieved when using fluidised bed furnaces or rotary kilns operated in slagging mode.

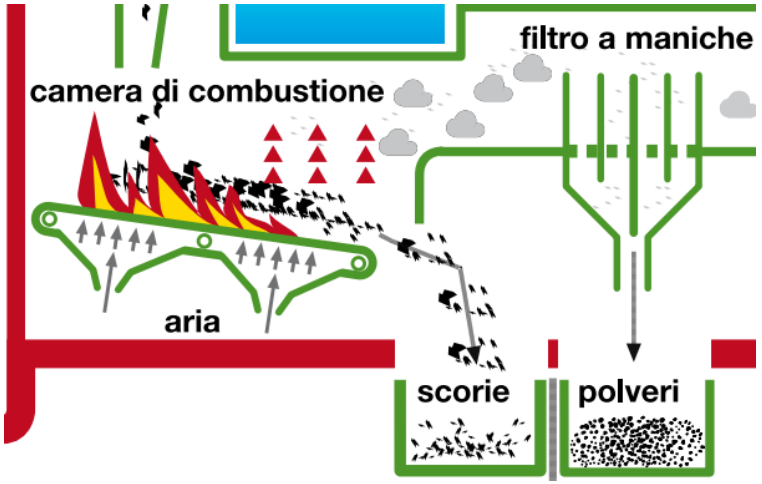
Bottom Ash handling and treatment

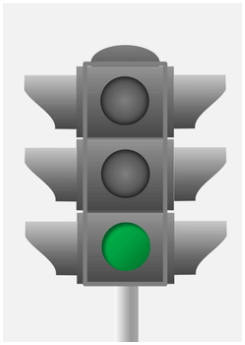


Both plants utilise a wet bottom ash discharge



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





Questions:

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

- Is it done in all plants ?
- What about boiler ashes? Are they collected separately from Bottom ashes?

Chapter 7: Recommendation for future work says:

"Related to the mixing of different incineration residues for their subsequent treatment:to collect information on the composition of incineration bottom ashes and boiler ashes and on the possible consequences of their mixing on the hazardousness of the resulting material (not only considering the dilution effect) and on the overall material recovery rates"

Is any other separation of incineration residues done at your plant?
Which ones?

Bottom Ash treatment plant

The two WtE plants do not have a bottom ash treatment plant on site, but they have a temporary storage and send them to a dedicated IBA treatment plant. **The following BATs <u>are not applicable</u>**

Waste framework directive (WFD): 'treatment' means recovery or disposal operations, including preparation prior to recovery or disposal;

D15: 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)

BAT-c 23. In order to prevent or reduce diffuse dust emissions to air from the <u>treatment of slags and bottom ashes</u>, BAT is to include in BAT-c 1:

- identification of the most relevant diffuse dust emission sources (e.g. using EN 15445);
- definition and implementation of appropriate actions and techniques to prevent or reduce diffuse emissions over a given time frame.

and to use an appropriate combination of the techniques given below. (BAT-c 24)

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

BAT-c 26 – applied if technique **f** is used – use of a bag filter

BAT-AEL (mg/Nm^3)	Averaging period
2–5	Average over the sampling period

Some of them are common measures in WtE plants which only have a temporary storage of Bottom Ash to avoid diffuse dust emissions

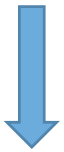
Bottom Ash treatment plant

BAT-c 36. In order to increase resource efficiency for the treatment of slags and bottom ashes, BAT-c 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

Screening and sieving
Crushing
Aeraulic separation
Recovery of ferrous and non-ferrous metals
Ageing
Washing

Only applicable to bottom ash treatment plants

Bottom ash treatment plant, definition:
"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."



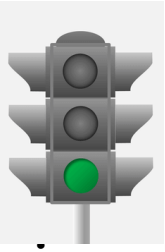
e.g. Ferrous metals separation inside the plant does not qualify the plant as a BA treatment plant

	Technique	Description	Applicability
a.	Screening and sieving	Oscillating screens, vibrating screens and rotary screens are used for an initial classification of the bottom ashes by size before further treatment.	Generally applicable.
b.	Crushing	Mechanical treatment operations intended to prepare materials for the recovery of metals or for the subsequent use of those materials, e.g. in road and earthworks construction.	Generally applicable.
c.	Aeraulic separation	Aeraulic separation is used to sort the light, unburnt fractions commingled in the bottom ashes by blowing off light fragments. A vibrating table is used to transport the bottom ashes to a chute, where the material falls through an air stream that blows uncombusted light materials, such as wood, paper or plastic, onto a removal belt or into a container, so that they can be returned to incineration.	Generally applicable.
d.	Recovery of ferrous and non-ferrous metals	Different techniques are used, including: • magnetic separation for ferrous metals; • eddy current separation for non-ferrous metals; • induction all-metal separation.	Generally applicable.
e.	Ageing	The ageing process stabilises the mineral fraction of the bottom ashes by uptake of atmospheric CO_2 (carbonation), draining of excess water and oxidation. Bottom ashes, after the recovery of metals, are stored in the open air or in covered buildings for several weeks, generally on an impermeable floor allowing for drainage and run-off water to be collected for treatment. The stockpiles may be wetted to optimise the moisture content to favour the leaching of salts and the carbonation process. The wetting of bottom ashes also helps prevent dust emissions.	Generally applicable.
f.	Washing	The washing of bottom ashes enables the production of a material for recycling with minimal leachability of soluble substances (e.g. salts).	Generally applicable.

Emissions to water

Bologna

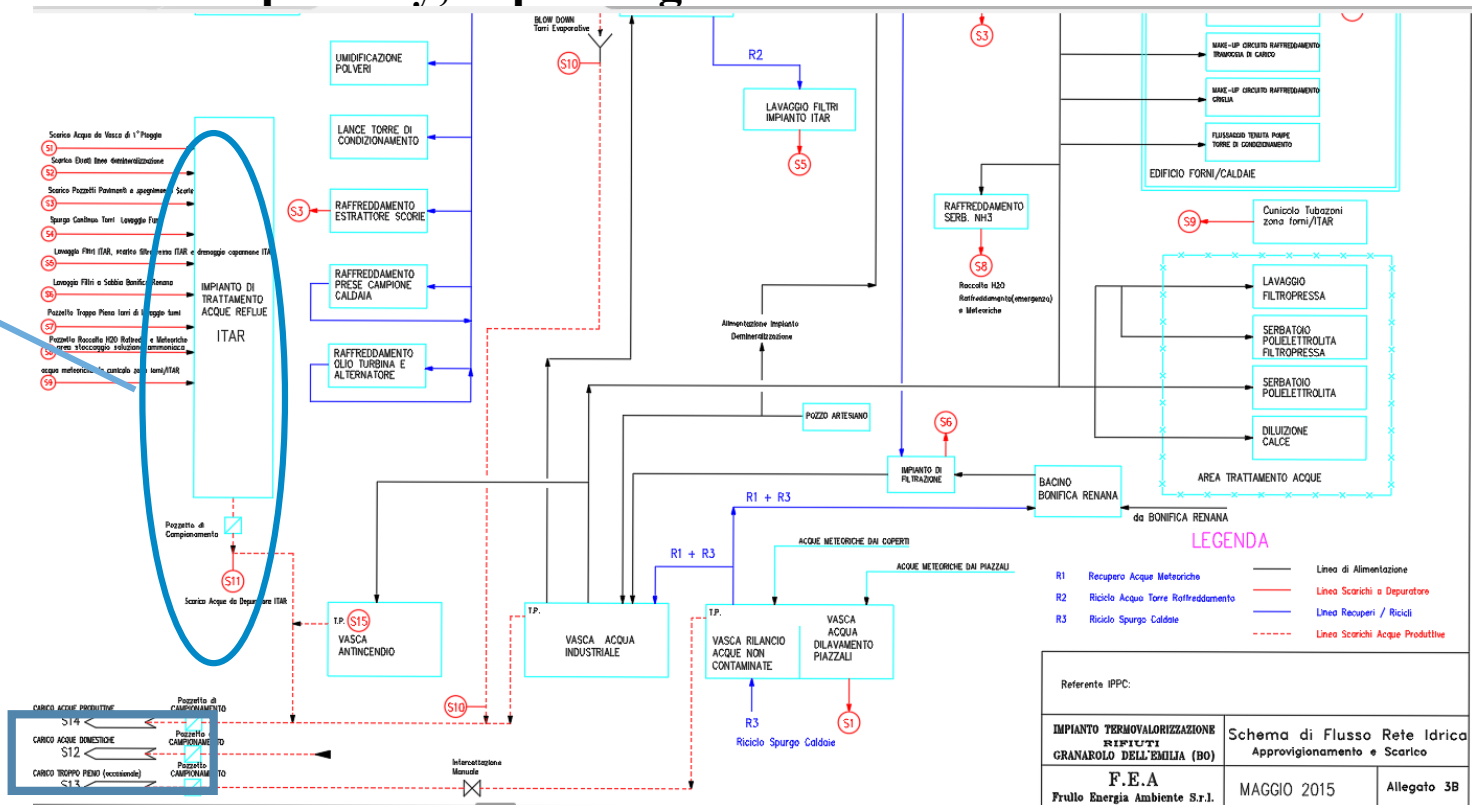
BAT-c 32 – Reduce water content



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.

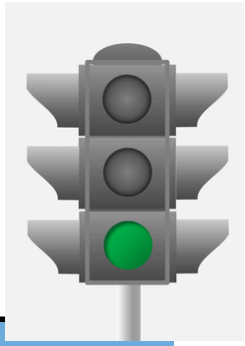
Waste water treatment

Uncontaminated water discharge



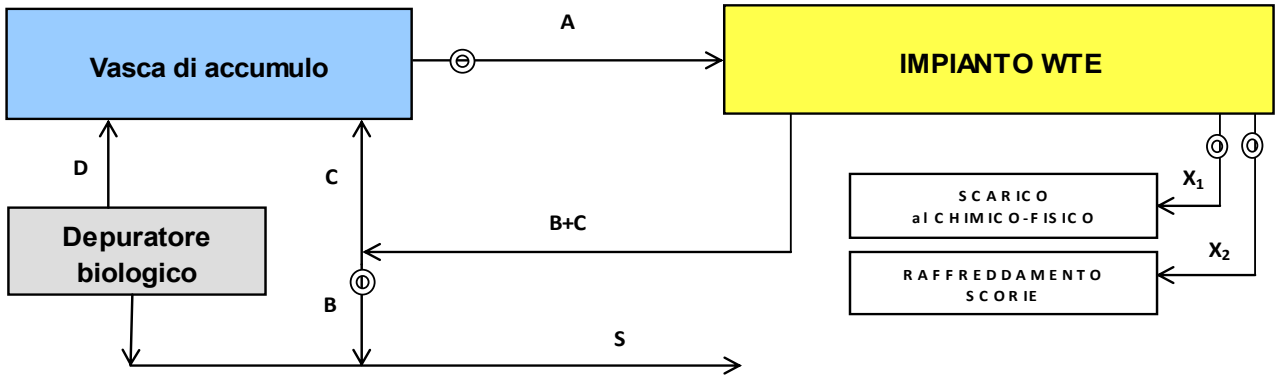
Emissions to water
BAT-c 33 – Reduce water usage

≥1 technique



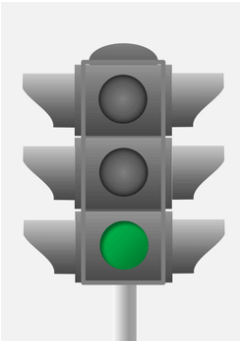
BAT is to use **one or a combination** of the techniques given below:

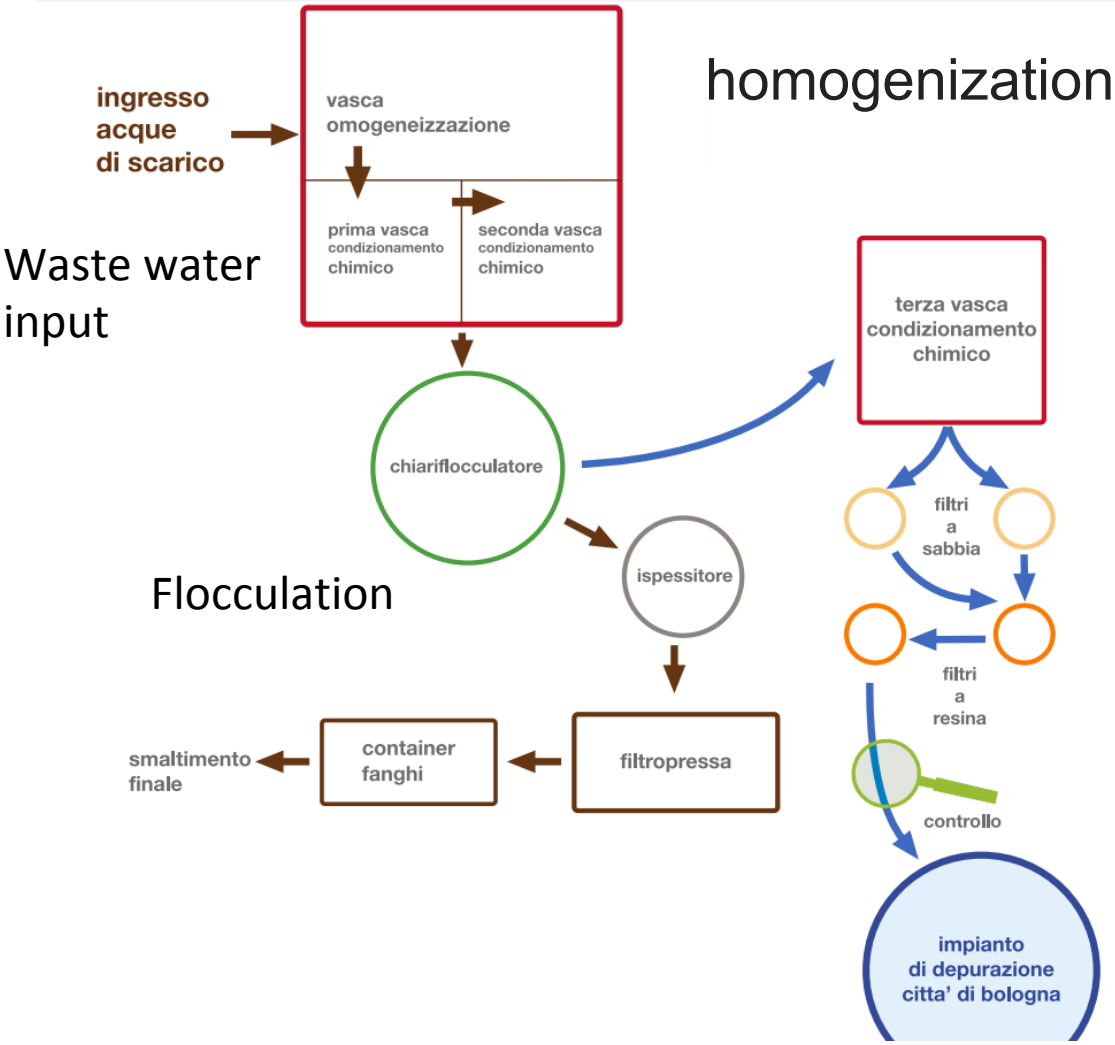
Technique	Plant
Waste-water-free FGC techniques	Modena
Injection of waste water from FGC	X
Water reuse/recycling	Bologna, Modena
Dry bottom ash handling	X



Modena

Emissions to water





homogenization tank

Waste water input

Flocculation

Indirect emissions to another treatment plant

Emissions to water

BAT-c 34 – Reduce emissions to water from:

- **FGC system**
- **Storage of slags and bottom ashes**
- **Treatment of slags and bottom ashes**

Using a combination of the techniques below, and using the secondary techniques as close as possible to the source in order to avoid dilution:

Primary technique:

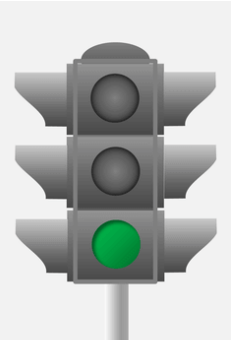
a. Optimisation of the incineration process (BAT-c 14) and/or of the FGC system, e.g. SNCR/SCR – in particular:

Optimisation of the reagent to NOX ratio over the cross-section of the furnace or duct, of the size of the reagent drops and of the temperature window in which the reagent is injected

Secondary techniques

Modena

b. Equalisation
c. Neutralisation
d. Physical separation
e. Adsorption on activated carbon
f. Precipitation
g. Oxidation
h. Ion exchange
i. Stripping
j. Reverse Osmosis
k. Coagulation and flocculation
l. Sedimentation
m. Filtration
n. Flotation



Emissions to water
Physico-chemical treatment

Modena

Waste water are sent directly to the physico-chemical treatment plant which is in the same installation (covered by the same permit)

Water emissions – general consideration

Emission levels associated with the best available techniques (BAT-AELs) for emissions to water

Emission levels associated with the best available techniques (BAT-AELs) for emissions to water given in these BAT conclusions refer to concentrations (mass of emitted substances per volume of waste water), expressed in mg/l or ng I-TEQ/l.

For waste water from FGC, the BAT-AELs refer either to spot sampling (for TSS only) or to daily averages, i.e. 24-hour flow-proportional composite samples. Time-proportional composite sampling can be used provided that sufficient flow stability is demonstrated.

For waste water from bottom ash treatment, the BAT-AELs refer to either of the following two cases:

- in the case of continuous discharges, daily average values, i.e. 24-hour flow-proportional composite samples;
- in the case of batch discharges, average values over the release duration taken as flow-proportional composite samples, or, provided that the effluent is appropriately mixed and homogeneous, a spot sample taken before discharge.

The BAT-AELs for emissions to water apply at the point where the emission leaves the installation.

This rule still applies (Chapter 2 of the IED):

IED, article 15.1

The emission limit values for polluting substances shall apply at the point where the emissions leave the installation, and any dilution prior to that point shall be disregarded when determining those values.

Water emissions – general consideration

IED, article 15.1

The emission limit values for polluting substances shall apply at the point where the emissions leave the installation, and any dilution prior to that point shall be disregarded when determining those values.

Portata m3 totali		167,1	327	Rapporto tra portate	1,96		
Denominazione		Acqua S11 ponderata su portata A4	Acqua S11			Rapporto tra portate	
Data: 10/01/2018		gennaio	gennaio	LimitiTitolo III bis parte quarta del D.Lgs152/06 (all.1,par.De par.E)		1,96	
Parametro	U. M.	mg/l	mg/l	mg/l	Esito		rendimento
Arsenico	mg/L	0,019571463	0,01	0,1500	ok		48,91
Cadmio	mg/L	0,004892866	0,0025	0,0500	ok		48,91
Cromo totale	mg/L	0,019571463	0,01	0,5000	ok		48,91
Cromo esavalente	mg/L	0,019571463	0,01	0,2000	ok		48,91
Mercurio	mg/L	0,000978573	0,0005	0,0300	ok		48,91
Nichel	mg/L	0,009785731	0,005	0,5000	ok		48,91
Piombo	mg/L	0,004892866	0,0025	0,2000	ok		48,91
Rame	mg/L	0,004892866	0,0025	0,5000	ok		48,91
Tallio	mg/L	0,019571463	0,01	0,0500	ok		48,91
Zinco	mg/L	0,009785731	0,005	1,5000	ok		48,91
Idrocarburi Policiclici Aromatici (IPA)	mg/L	0,000004893	0,0000025	0,0002	ok		48,91
Sommatoria PCDD, PCDF	ng I-TEQ/	0,055778669	0,0285	0,3000	ok		48,91
Sommatoria PCB	ngWHO-te	0,006458583	0,0033	0,3000	ok		48,91

Flow rate ratio: 1.96

Water in output from the WWT plant / FGC system water

Correction to the flow rate ratio

Pollutants monitored at WWT exit

Water emissions – Compliance rules

ELVs from IED

IED Annex 6, part 8

2. Water emission limit values

The emission limit values for water shall be regarded as being complied with if: (a) for total suspended solids 95 % and 100 % of the measured values do not exceed the respective emission limit values as set out in Part 5;

(b) for heavy metals (Hg, Cd, TI, As, Pb, Cr, Cu, Ni and Zn) **no more than one measurement per year exceeds the emission limit values set out in Part 5;** or, if the Member State provides for more than 20 samples per year, no more than 5 % of these samples exceed the emission limit values set out in Part 5;

(c) for dioxins and furans, the measurement results do not exceed the emission limit value set out in Part 5.

BATAELS based ELV

IED Chapter 2, Article 15.3 (a) or (b)

The competent authority shall set emission limit values that ensure that, under normal operating conditions, emissions do not exceed the emission levels associated with the best available techniques as laid down in the decisions on BAT conclusions referred to in Article 13(5) through either of the following:

(a) setting emission limit values that do not exceed the emission levels associated with the best available techniques. Those emission limit values shall be expressed for the same or shorter periods of time and under the same reference conditions as those emission levels associated with the best available techniques; or

(b) setting different emission limit values than those referred to under point (a) in terms of values, periods of time and reference conditions.

Water emissions – BATAELs – Direct emissions

Monitoring is in BAT-c 6

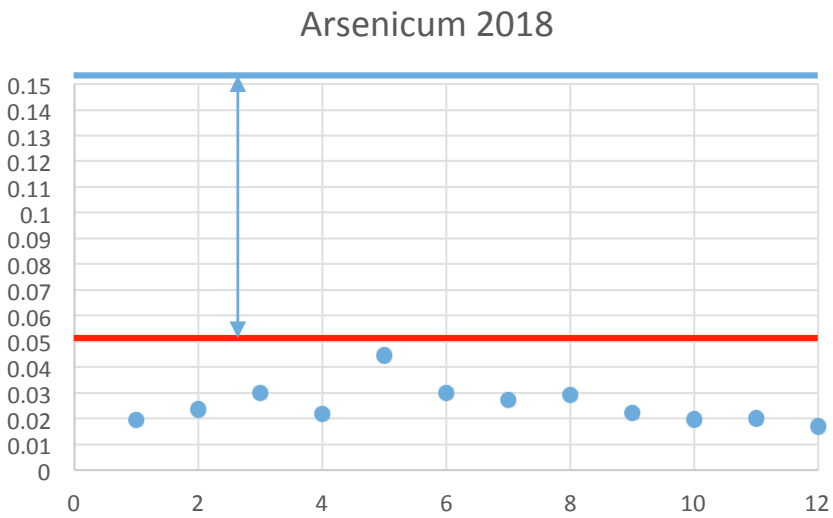
Indirect emissions apply to the emissions in green too

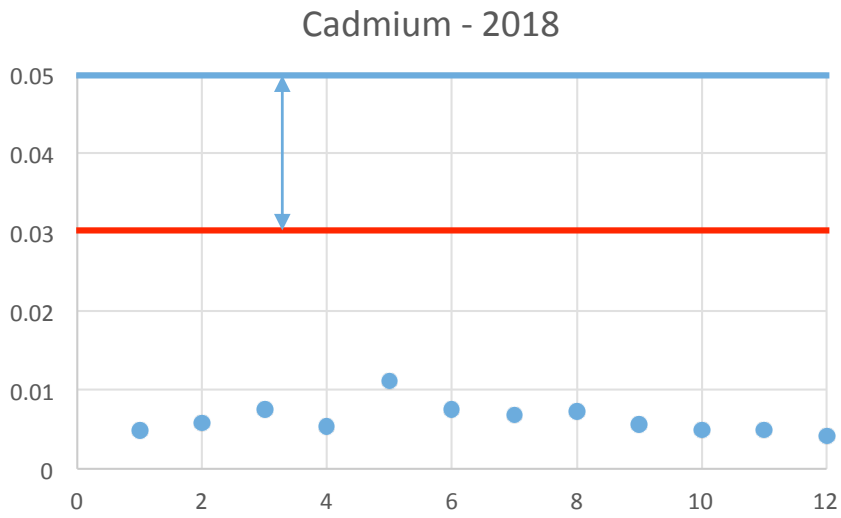
Parameter		Process	Unit	BAT-AEL ([1])	IED	
Total suspended solids (TSS)		FGC BA treatment	mg/l	10–30	30 (95%) - 45	Once every day
Total organic carbon (TOC)		FGC BA treatment		15–40	x	Once every month
Metals and metalloids	As	FGC		0.01–0.05	0,15	Once every month
	Cd	FGC		0.005–0.03	0,05	
	Cr	FGC		0.01–0.1	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 BA treatment		0.02–0.06	0,2	
	Sb	FGC		0.02–0.9	x	Once every month
	Tl	FGC		0.005–0.03	0,05	
	Zn	FGC		0.01–0.5	1,5	
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
([1]) The averaging periods are defined in the General considerations.						

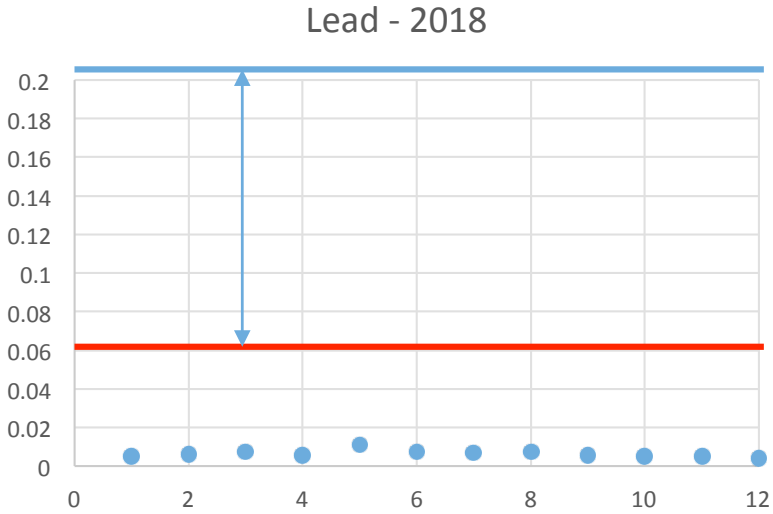
NOT applicable to Wte plants- IBA plant outside

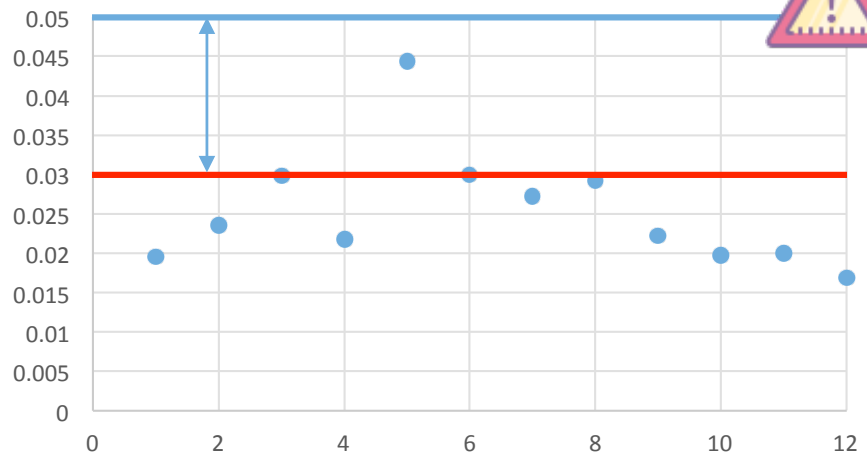
Water emissions – BATAELs

Bologna – wet FGC









IED ELV

BATAELs

All measures in mg/l

Possible issue

for heavy metals (Hg, Cd, TI, As, Pb, Cr, Cu, Ni and Zn) risk that there will not be any possibility to exceed the BATAEL based ELV

(previously: once per year according to the IED).

Question:

- **Do you have the possibility to exceed the water ELV once per year for the metals in your permit?**

Possible issues:

Water emission BATAELs have been set at very low levels.

Politically, the industrial sector is under pressure for the bad quality of the water basins. According to IED article 18:

«Where an environmental quality standard requires stricter conditions than those achievable by the use of the best available techniques, additional measures shall be included in the permit, without prejudice to other measures which may be taken to comply with environmental quality standards."

Questions:

Did you notice more interest from competent authorities in regards of water emissions?

Other possible issues:

New plant vs. Existing plant (relevant for energy efficiency and some BATAELS)

BREF definitions:

New plant	A plant first permitted following the publication of these BAT conclusions or a complete replacement of a plant following the publication of these BAT conclusions.

Existing plant	A plant that is not a new plant.

Incineration plant	Either a waste incineration plant as defined in Article 3(40) of Directive 2010/75/EU or a waste co-incineration plant as defined in Article 3(41) of Directive 2010/75/EU, covered by the scope of these BAT conclusions.

Major plant upgrade	A major change in the design or technology of a plant with major adjustments or replacements of the process and/or abatement technique(s) and associated equipment.

New plant vs. Existing plant

IED references:

IED Art.3(3)

3. (3) ‘installation’ means a stationary technical unit within which one or more activities listed in Annex I or in Part 1 of Annex VII are carried out, and any other directly associated activities on the same site which have a technical connection with the activities listed in those Annexes and which could have an effect on emissions and pollution;

IED Art. 3(7)

3. (7) ‘permit’ means a written authorisation to **operate all or part of an installation** or combustion plant, waste incineration plant or waste co-incineration plant;

IED Art. 3(40)

‘waste incineration plant’ means any stationary or mobile technical unit and equipment dedicated to the thermal treatment of waste […]

Question:
How the plant is considered if one (or more) line(s) are added to the installation?

Risk: if the plant will be considered as a ‘new plant’, the requirements for new plants will apply also to the existing part of the installation.

Thank you!

Questions?