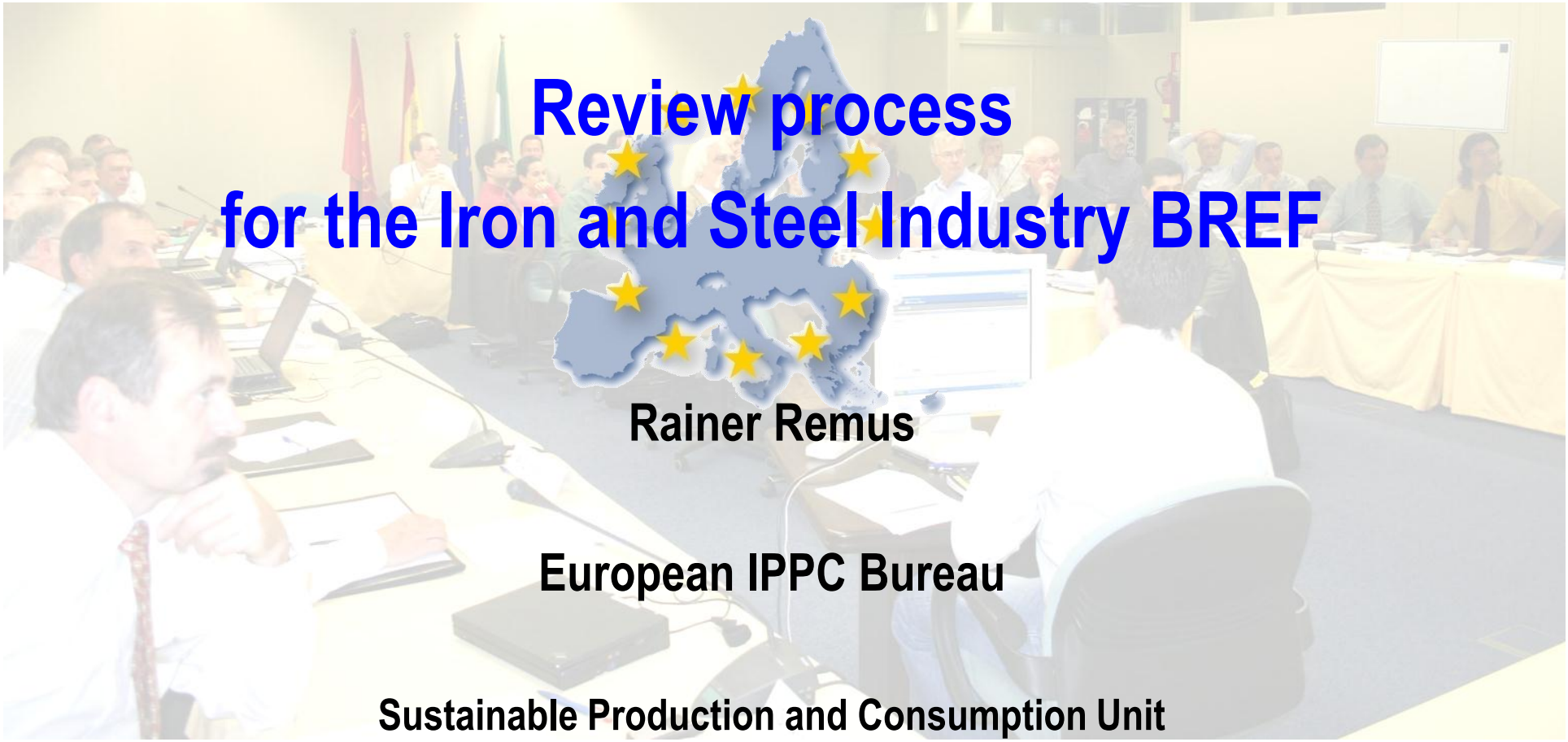

Review process for the Iron and Steel Industry BREF

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Review process for the IS BREF

The original Iron and Steel BREF was adopted in December 2001 and was one of the first BREFs in a series of 33 documents. Consequently it was foreseen as one of the first BREFs to be reviewed.

Milestones in the review process for the IS BREF

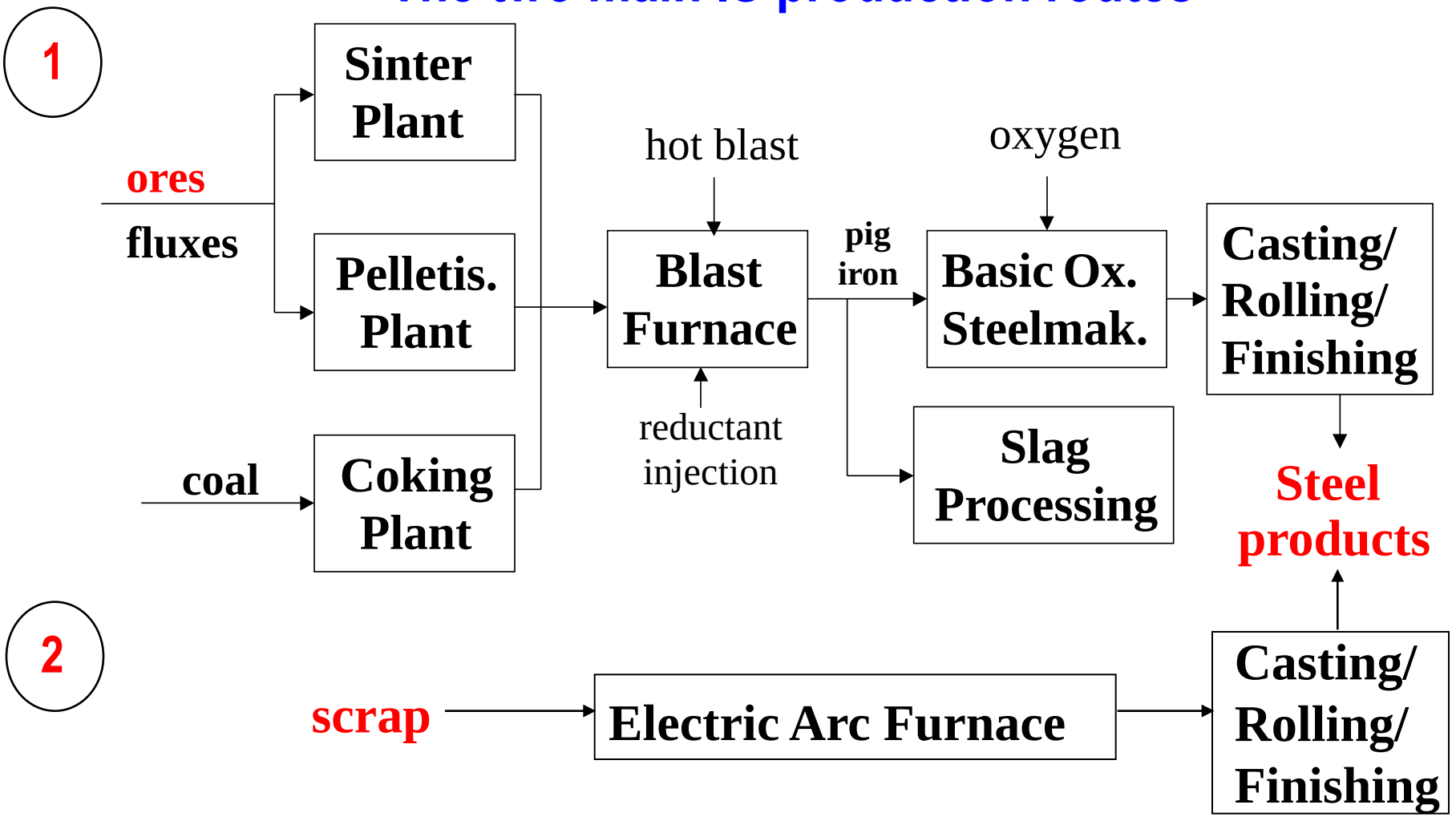
October 2005	Activation of the TWG for the review of the Iron and Steel BREF and submission of TWG wishes
September 2006	TWG kick off meeting
February 2008	First draft of the review of the Iron and Steel BREF (1250 comments received)
July 2009	Second draft of the review of the Iron and Steel BREF (1385 comments received)
January 2010	Third draft of the review of the Iron and Steel BREF
February 2010	Final TWG meeting
April 2010	Fourth draft of the review of the Iron and Steel BREF
October 2010	Fifth draft of the review of the Iron and Steel BREF
June 2011	Final draft of the review of the Iron and Steel BREF
September 2011	Forum opinion on the full BREF including BAT conclusions
November 2011	Adoption of the BAT conclusions by the Committee

Scope of the IS BREF

This document addresses the industrial activities specified in Annex I to the IED, namely:

- **Activity 1.3: coke production**
- **Activity 2.1: metal ore (including sulphide ore) roasting and sintering**
- **Activity 2.2: production of pig iron or steel including continuous casting, with a capacity exceeding 2.5 tonnes per hour**
- **The document also covers some activities that may be directly associated to these activities on the same site, i.e. pelletisation plants.**

The two main IS production routes



The share of the two main IS production routes

In 2006 in the EU-27:

- 60 % of the steel production was based on the blast furnace/basic oxygen furnace route (123 Mio. tonnes)
- 40 % was based on the EAF route (83 Mio. tonnes)

Turkish steel industry:

- 2nd largest producer of steel in Europe (approx. 26 Mio. tonnes)
- 10th most important steel-producing country globally
- 28 % blast furnace/basic oxygen furnace route
- 72 % EAF route (EAF mills)
- Largest scrap consumer in Europe (25.3 million tonnes) in 2010
- World's largest importer of scrap metal

The structure of the IS BREF

- Preface
- Scope
- Chapter 1: General information (Production, economics and key environmental issues)
- Chapter 2: horizontal issues (horizontal matters which do not relate to one steel process only)
- Chapter 3 to 8 provide information on particular iron and steel processes (sinter plants, pelletisation, coke ovens, blast furnaces, basic oxygen steelmaking and casting, electric arc steelmaking and casting), including information on applied processes and techniques, current emission and consumption levels and techniques to consider in the determination of BAT. The latter consists of a catalogue of environmental techniques and forms the heart of the BREF.

The structure of the IS BREF

- In Chapter 9 are the BAT conclusions as defined in Article 3(12) of the Directive for Chapter 2 to 8.
- Chapter 10 provides information on alternative iron making techniques that are already being applied.
- Chapter 11 presents information on 'emerging techniques'
- Chapter 12 provides the concluding remarks and recommendations for future work
- Chapter 13 are the annexes.

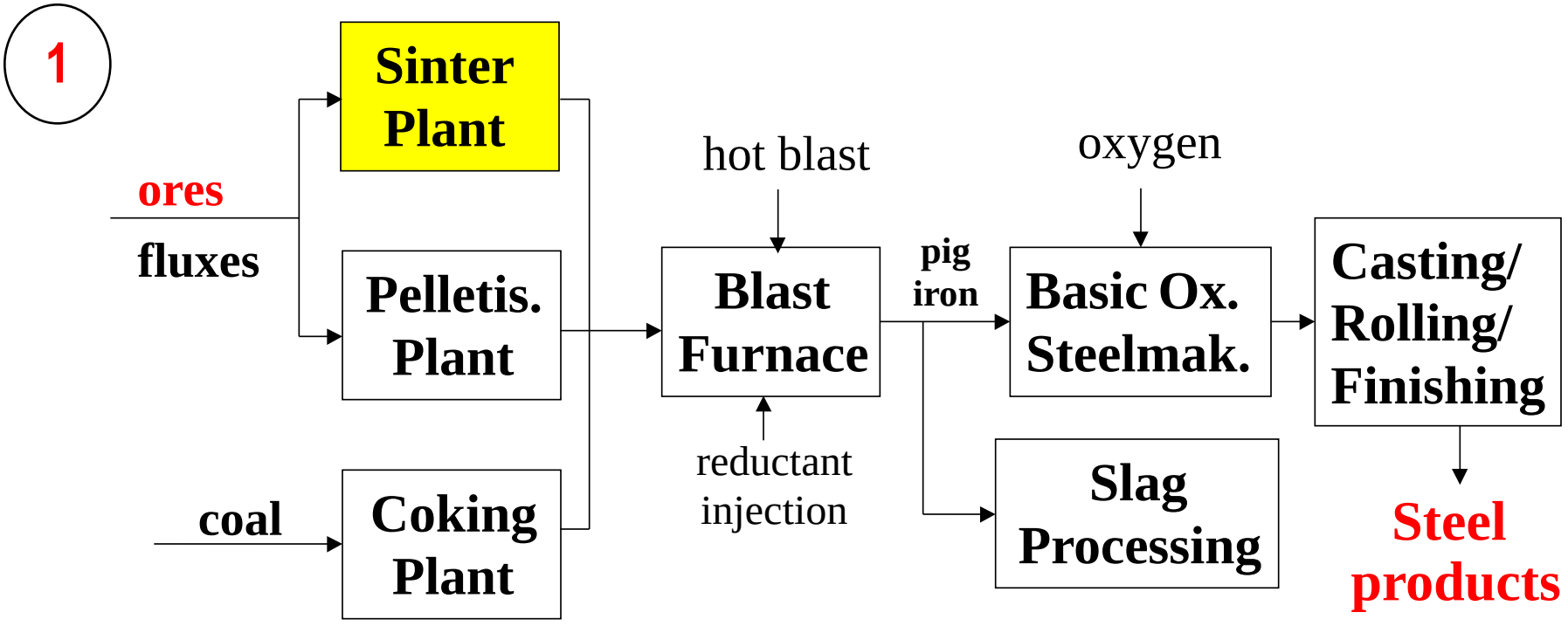
The key environmental issues in IS Production

The key environmental issues are:

- the reduction of emissions to air and water
- efficient energy and raw material usage
- minimisation, recovery and the recycling of process residues
- effective environmental and energy management systems.
- nuisance by noise emissions.

The key polluting substances emitted to air are dust, nitrogen oxides and sulphur dioxide. Carbon oxides, polyaromatic hydrocarbons, polychlorinated dibenzo-p-dioxins and dibenzofurans, total organic carbon, metals, hydrogen chloride and hydrogen fluoride are emitted as well.

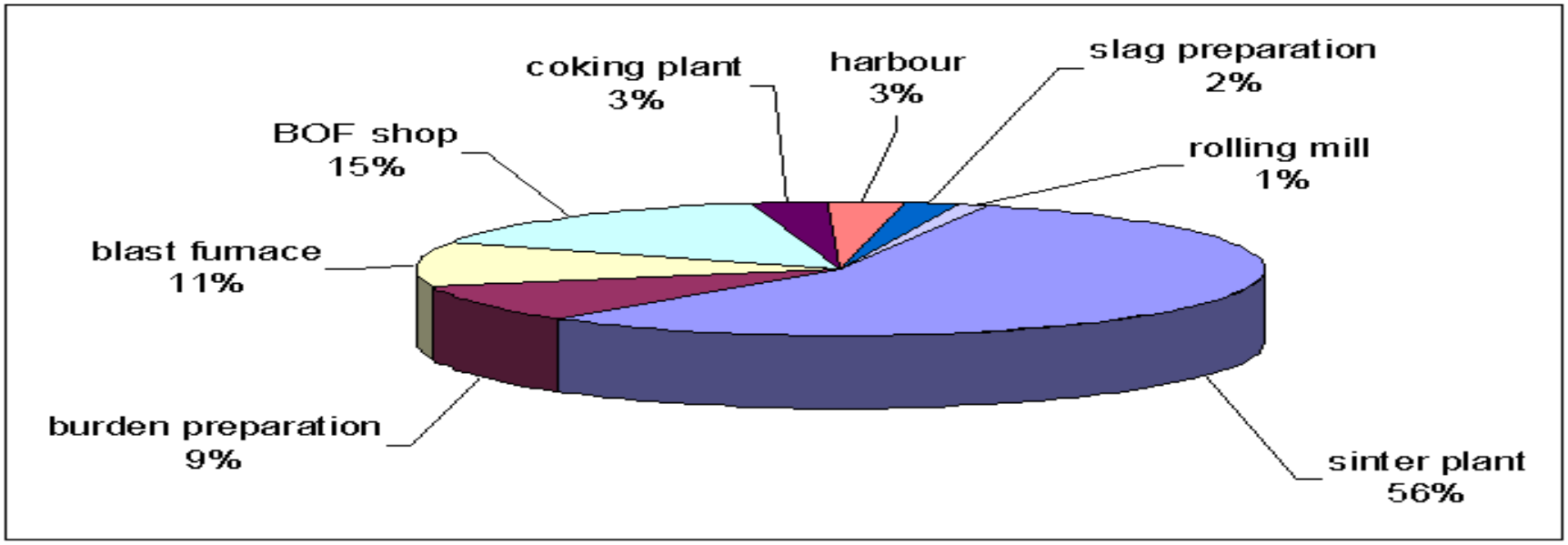
IS production from ores: Sinter plants



Sinter strand

Reduction of particulates in sinter plants

- Sinter plants are the major source for dust, heavy metal and dioxin emissions in IS production from ores



- Waste gases from sinter plants are characterized by:
  - high fine particles
  - high specific dust resistivity due to high alkaline content
  - high concentrations of dioxins, mercury, SO_2, HF and HCl

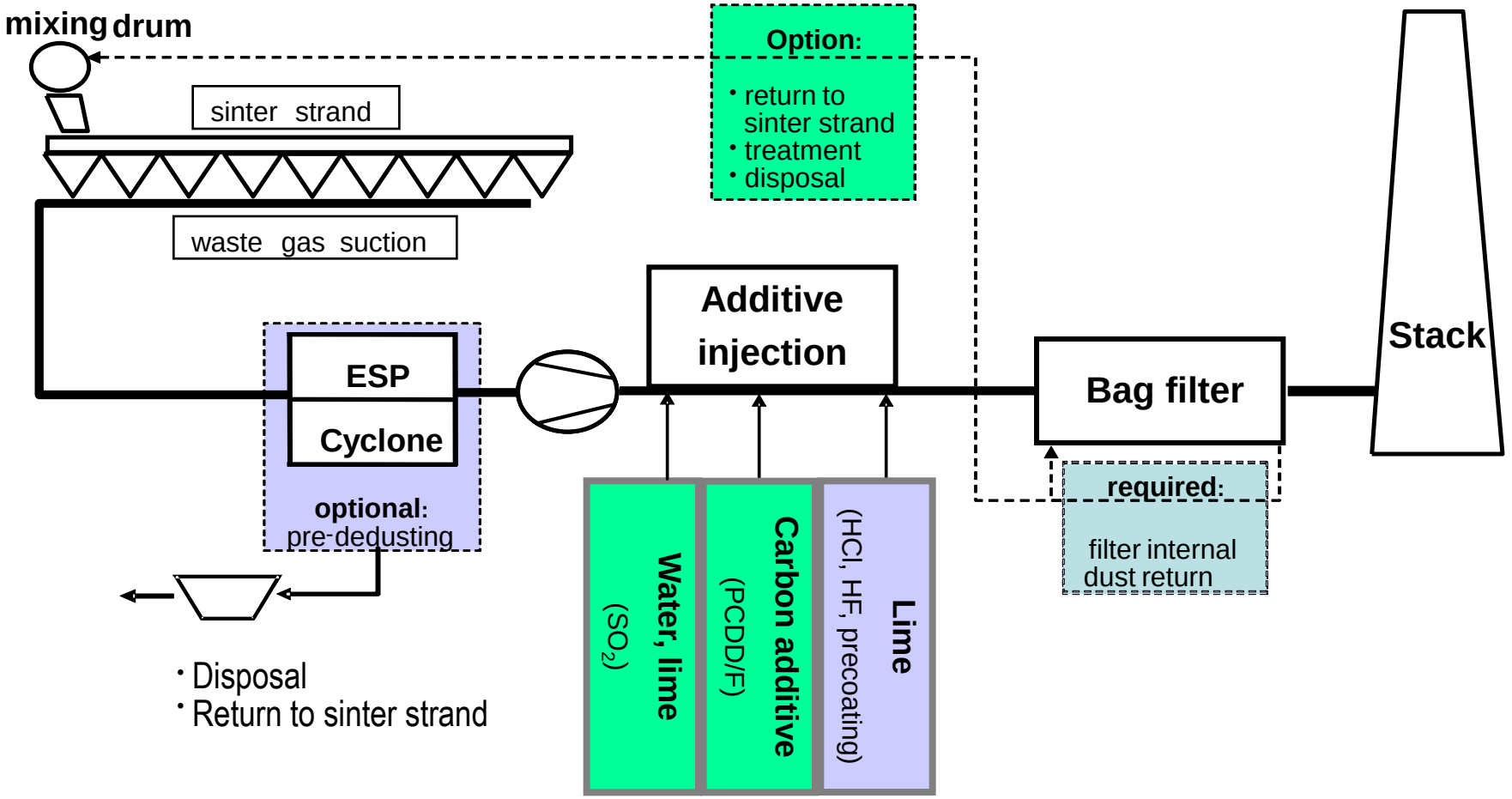
Dust abatement in sinter plants by advanced ESP and fabric filter

Technique	Type	Achieved emission levels [mg/Nm^3]	Averaging period
Fabric Filter	**Fabric Filter**	1 – 15	DAV
		<3	DAV
		<2	DAV
		<0.5	AAV
		<10	n/a
Eletrostatic precipitator (ESP)	**ESP**	36	AAV
	ESP	25 - 65	AAV
	MEEP[1] – ESP	25 – 56	DAV
	ESCS[2] – ESP	20 -37	n/a
	Energy pulse superimposition[3] – ESP	43 – 77	AV
	ESCS[2] – ESP	40	n/a
	Most ESP	**50 - 140**	n/a

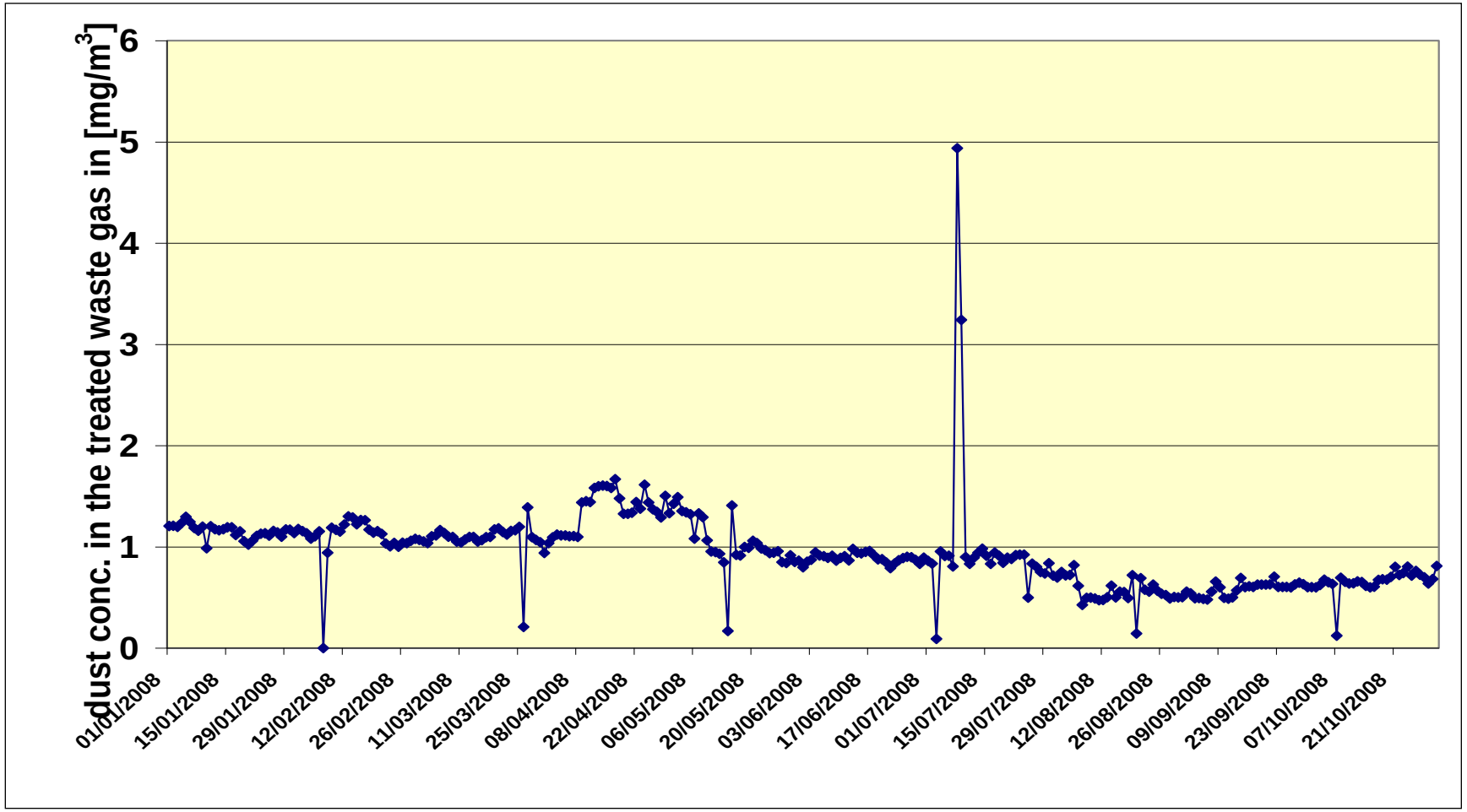
[1] Moving electrodes electrostatic precipitator
[2] Electrostatic space cleaner super
[3] Energy puls superimposing

DAV = Daily average
AAV = Annual average
n/a = not reported

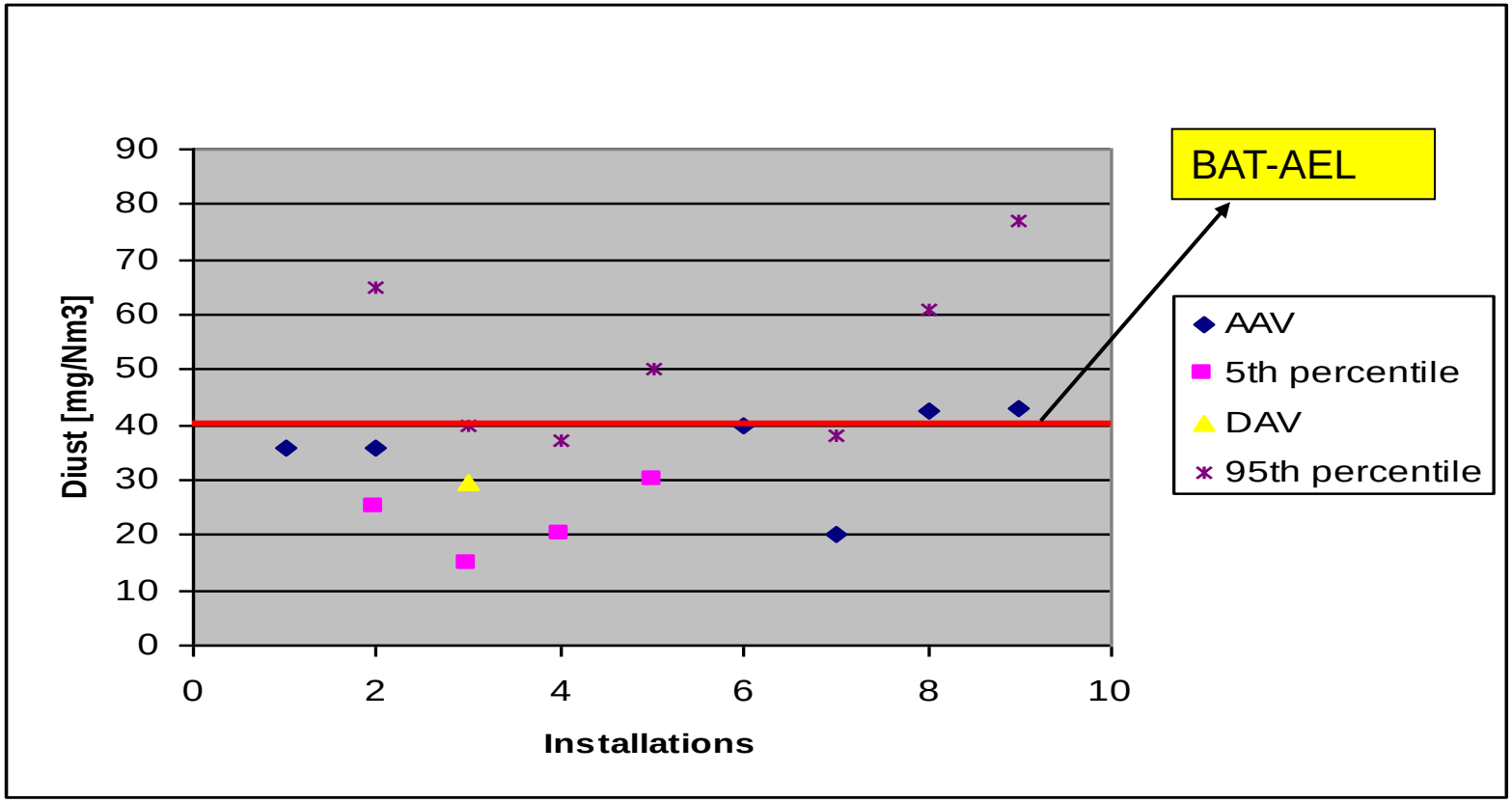
Control of dust, PDCC/F, HCl, HF and SO_x emissions by prededusting-additive injection-final dedusting



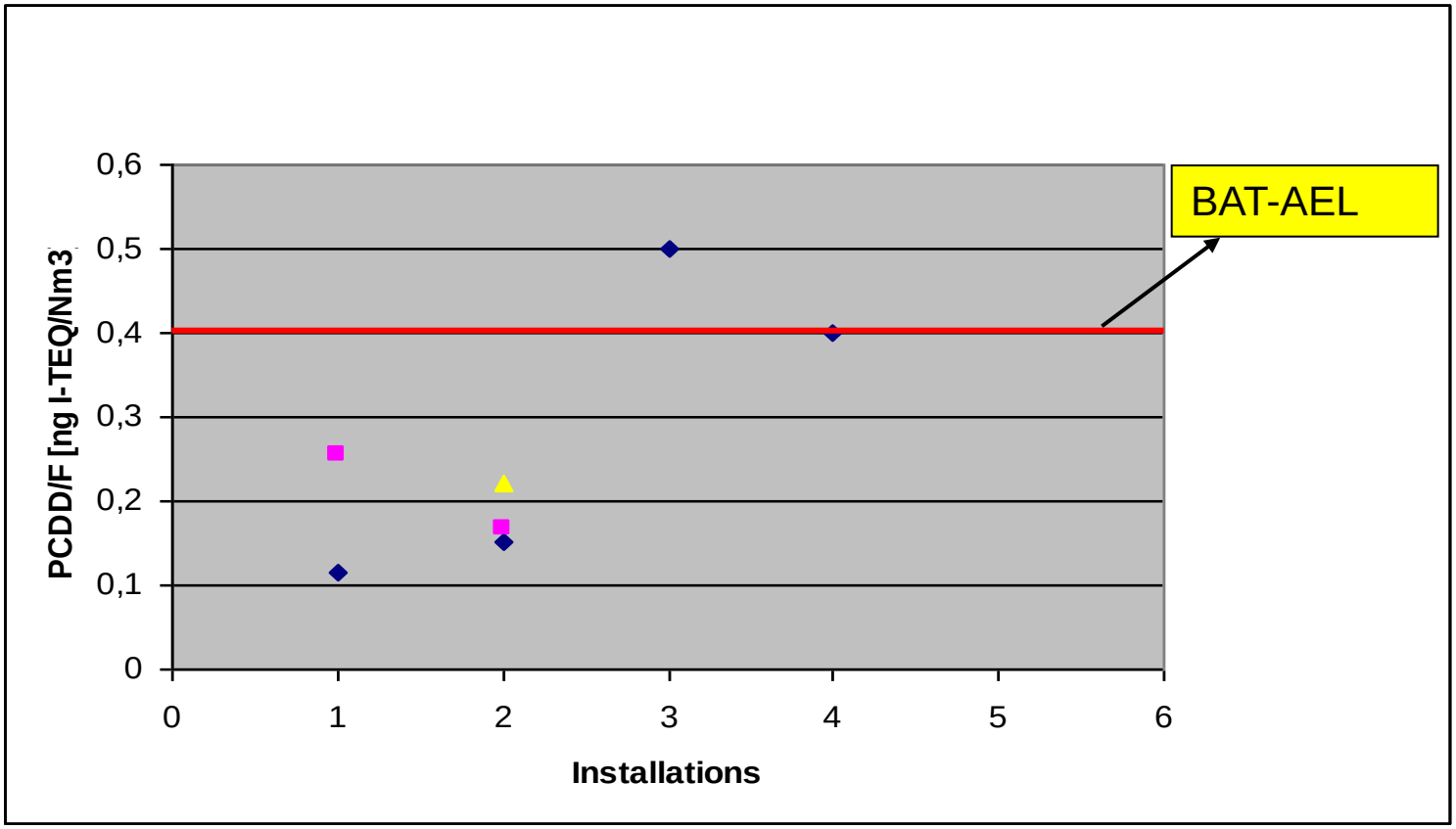
Performance for dust from Jan – Oct 2008 (daily mean values)



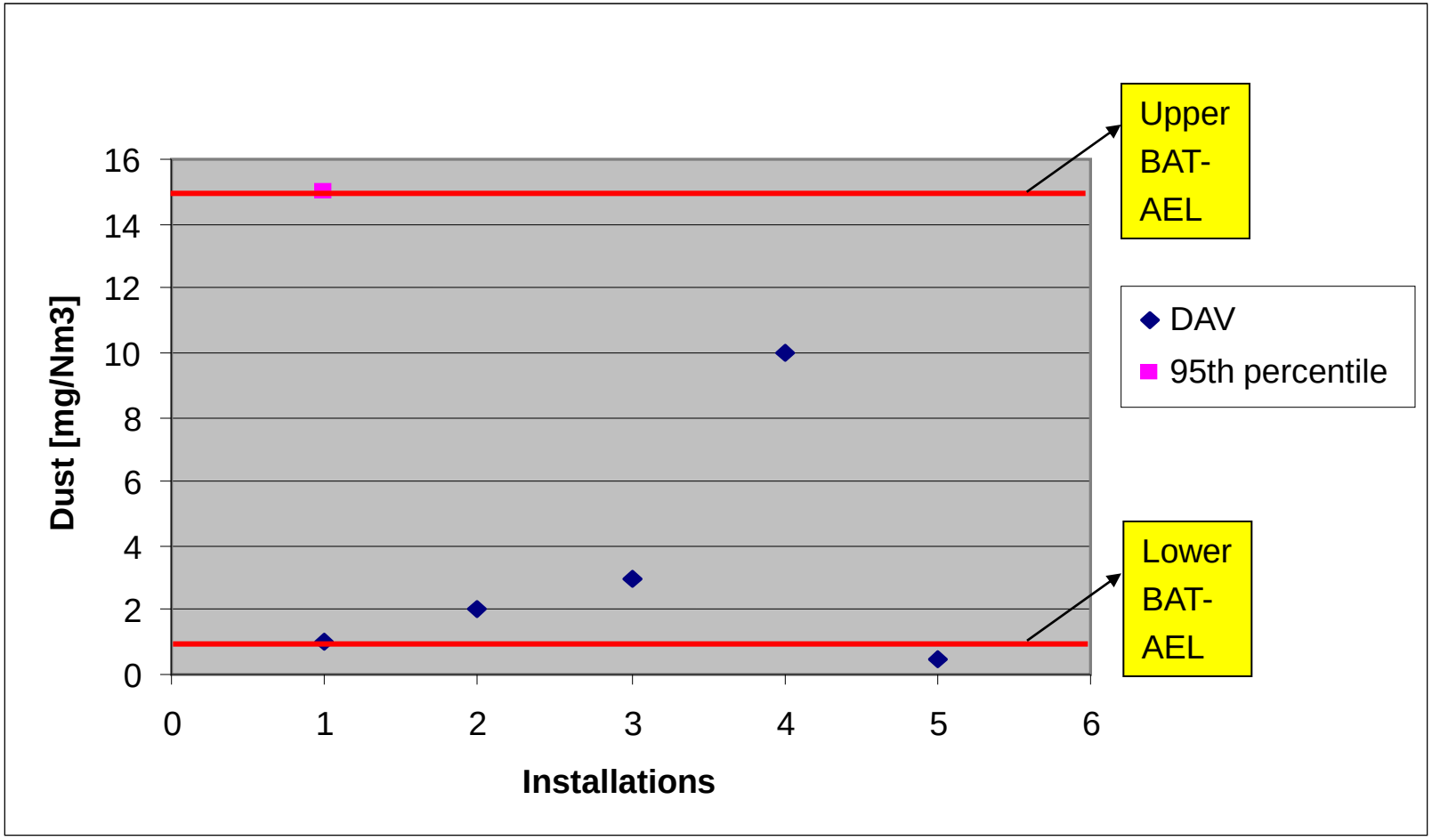
Sinter strand primary dust emissions with ESP



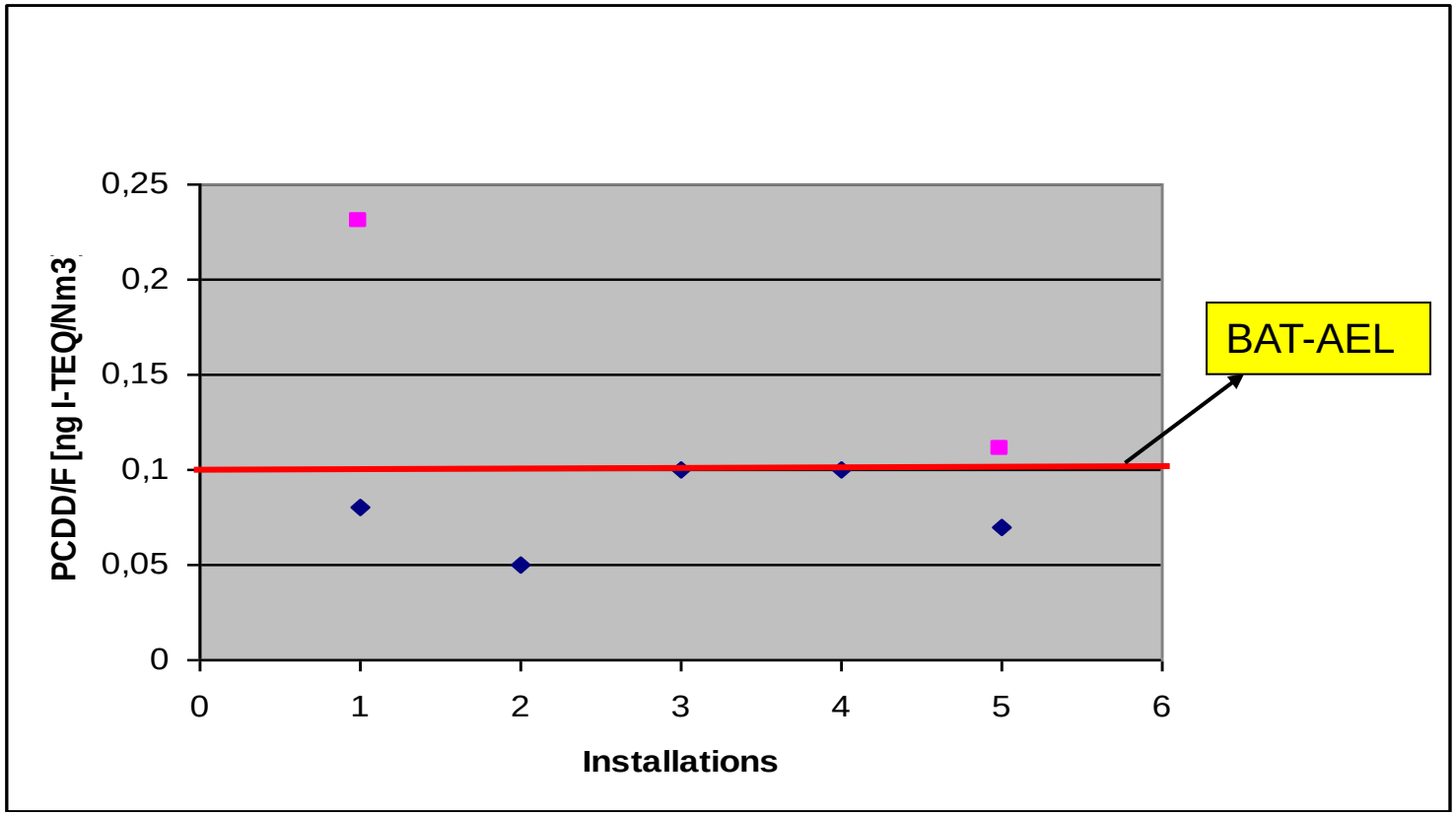
PCDD/F emissions with ESP and additive injection from sinter strand



Dust emissions from 5 sinter strands with fabric filter



Dioxin emissions with fabric filter and additive injection from 5 sinter strands



BAT conclusion for dust emissions from the sinter plant

20. BAT for primary emissions from sinter plants is to reduce dust emissions from the sinter strand waste gas by means of a bag filter.

BAT for primary emissions for existing plants is to reduce dust emissions from the sinter strand waste gas by using advanced electrostatic precipitators when bag filters are not applicable.

The BAT-associated emission level for dust is <1 – 15 mg/Nm^3 for the bag filter and <20 – 40 mg/Nm^3 for the advanced electrostatic precipitator (which should be designed and operated to achieve these values), both determined as a daily mean value.

Bag Filter

Description: Bag filters used in sinter plants are usually applied downstream of an existing electrostatic precipitator or cyclone but can also be operated as a standalone device.

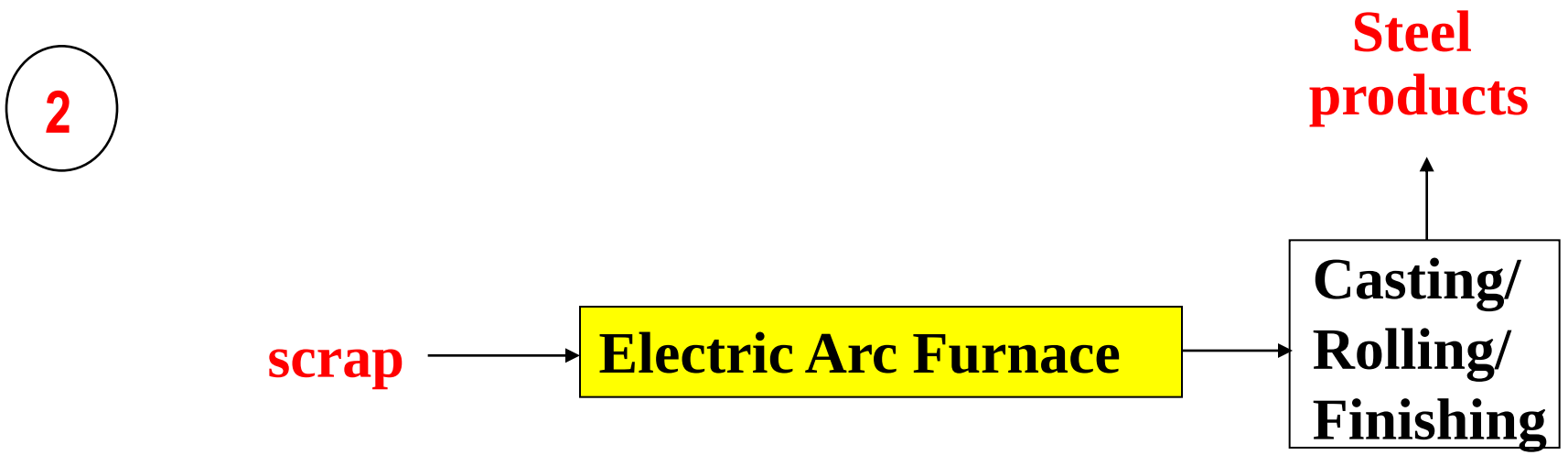
Applicability: For existing plants requirements such as space for a downstream installation to the electrostatic precipitator can be relevant. Special regard should be given to the age and the performance of the existing electrostatic precipitator.

BAT conclusion for dioxin prevention and reduction in sinter plant off-gas

25. BAT for primary emissions from sinter strands is to reduce emissions of polychlorinated dibenzodioxins/furans (PCDD/F) and polychlorinated biphenyls (PCB) by using injection of adequate adsorption agents into the waste gas duct of the sinter strand before dedusting with a bag filter or advanced electrostatic precipitators when bag filters are not applicable.

The BAT- associated emissions level for polychlorinated dibenzodioxins/furans (PCDD/F) is <0.05 – 0.2 ng I-TEQ/Nm^3 for the bag filter and <0.2 – 0.4 ng-I-TEQ/Nm^3 for the advanced electrostatic precipitator, both determined for a 6 – 8 hour random sample under steady-state conditions.

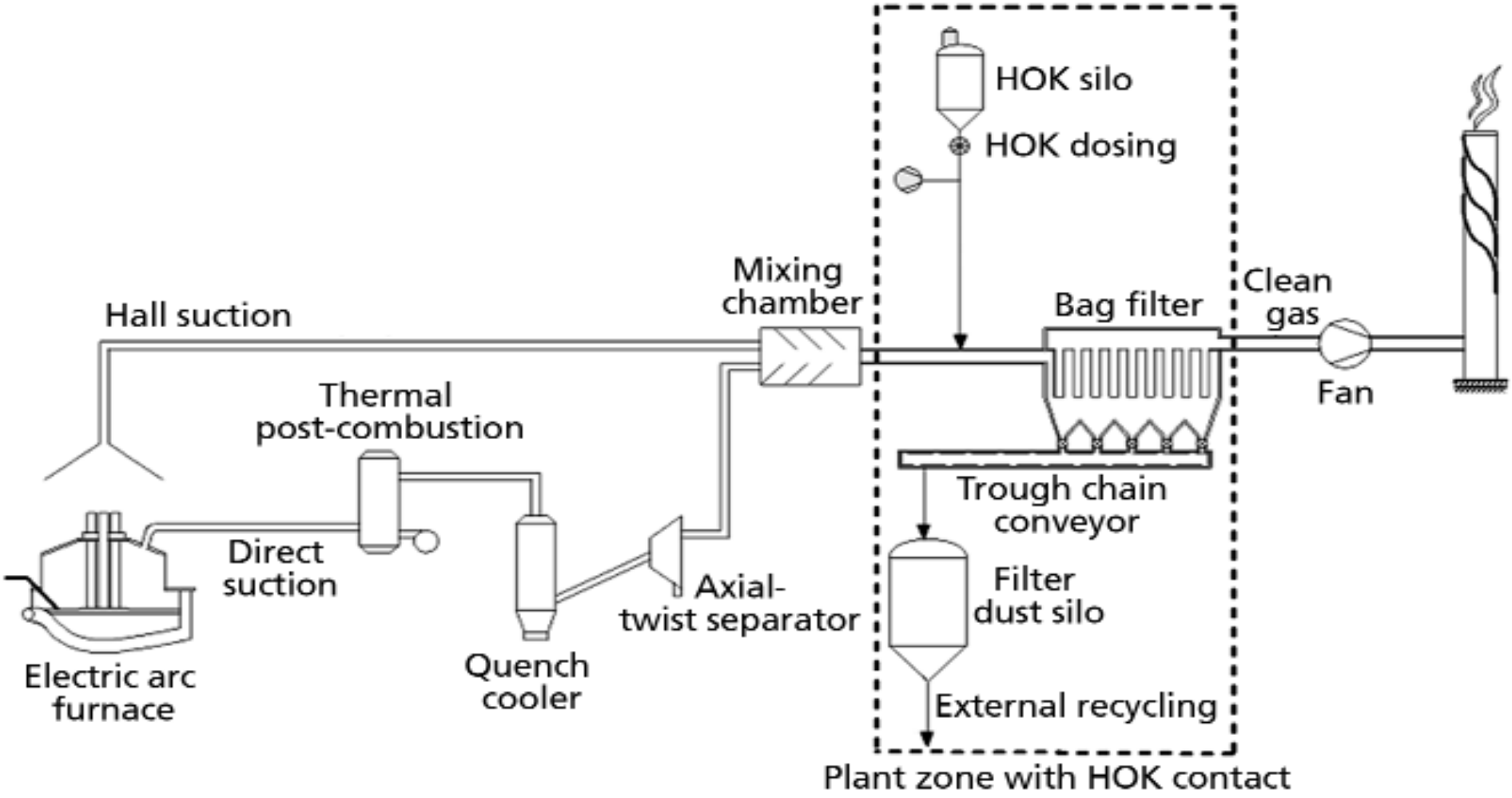
IS production from scrap: Electric Arc Furnace



Electric Arc Furnace

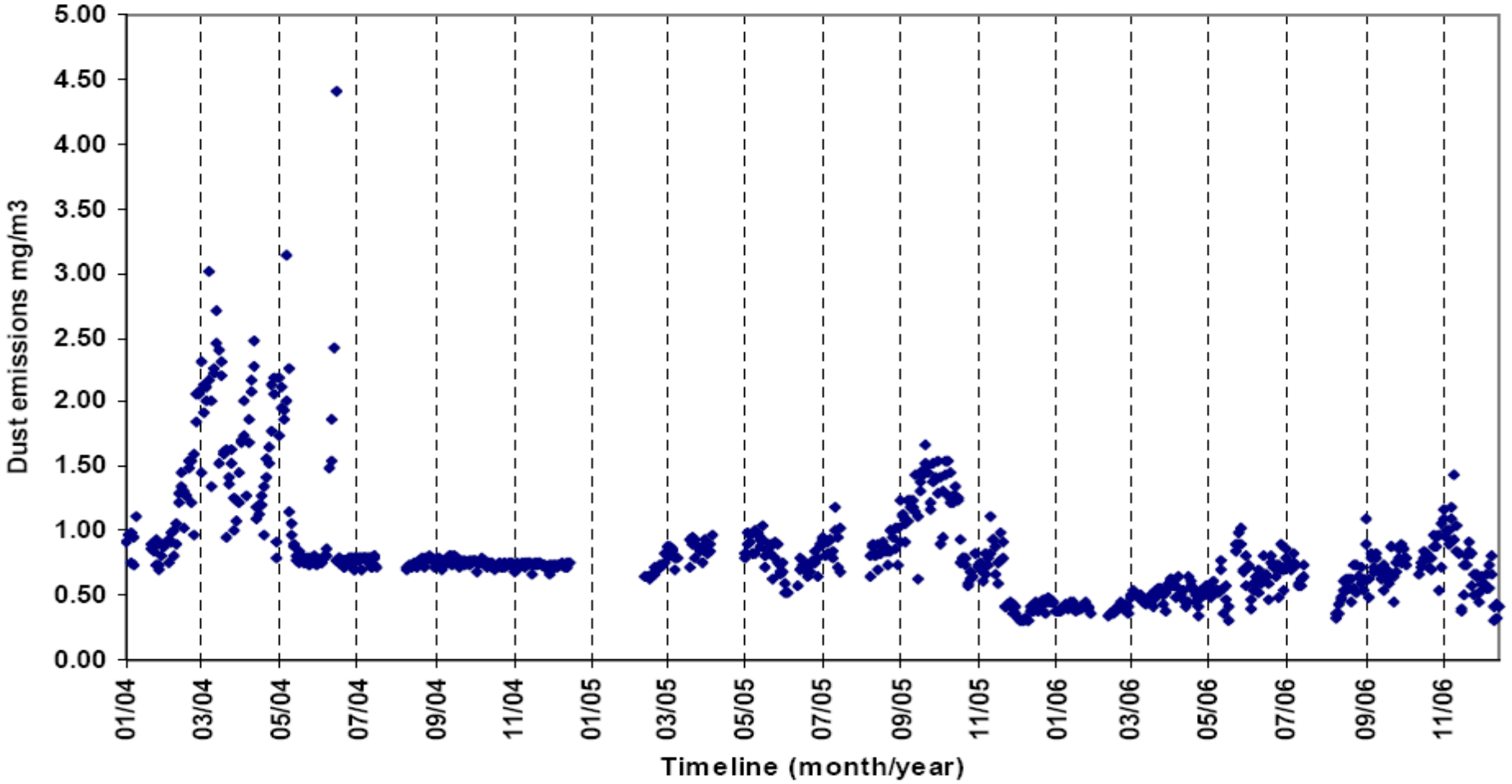
Charging the furnace

Typical off-gas collection and treatment system in an EAF

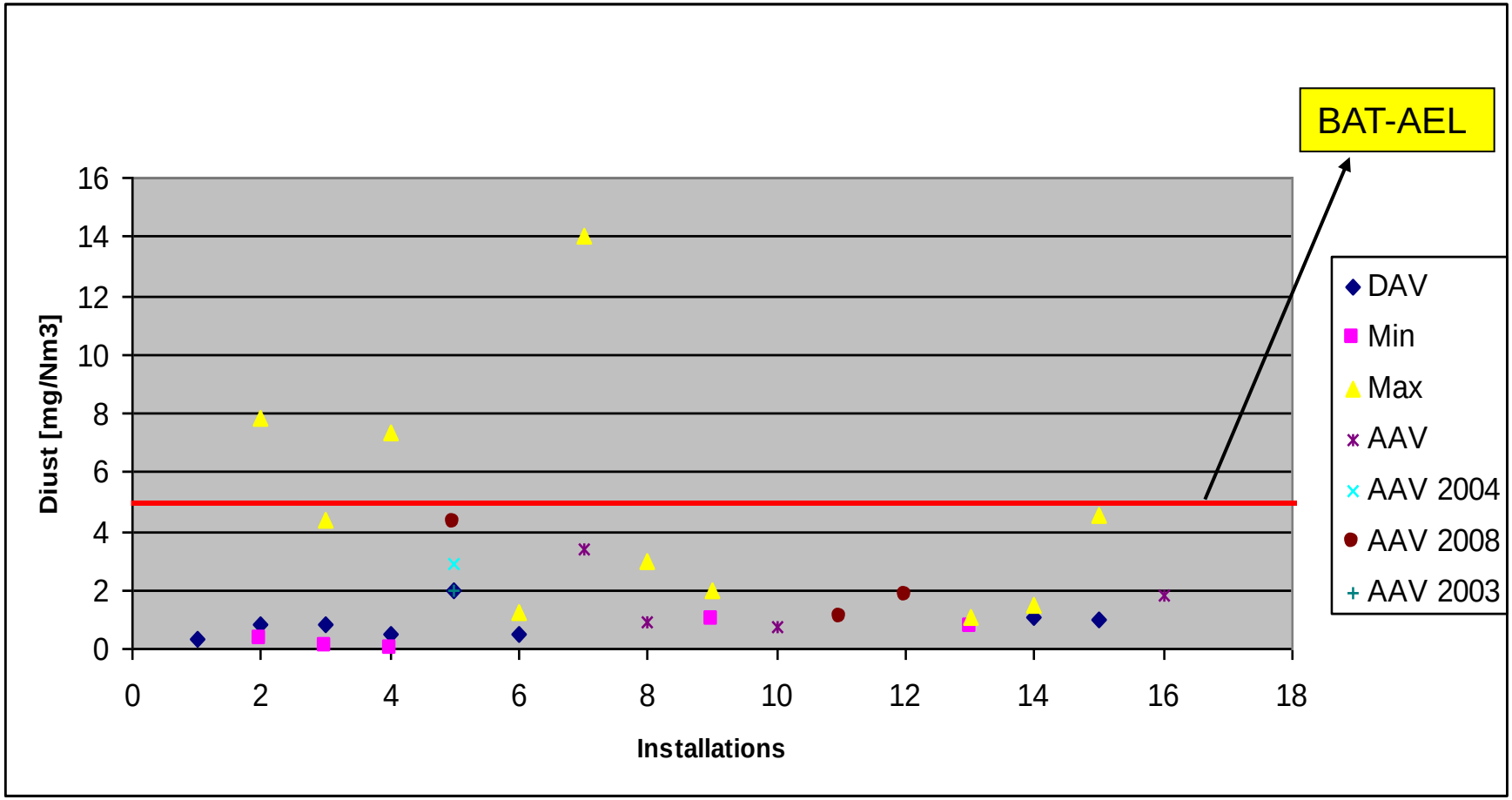


Overall view of the activated lignite dosing system

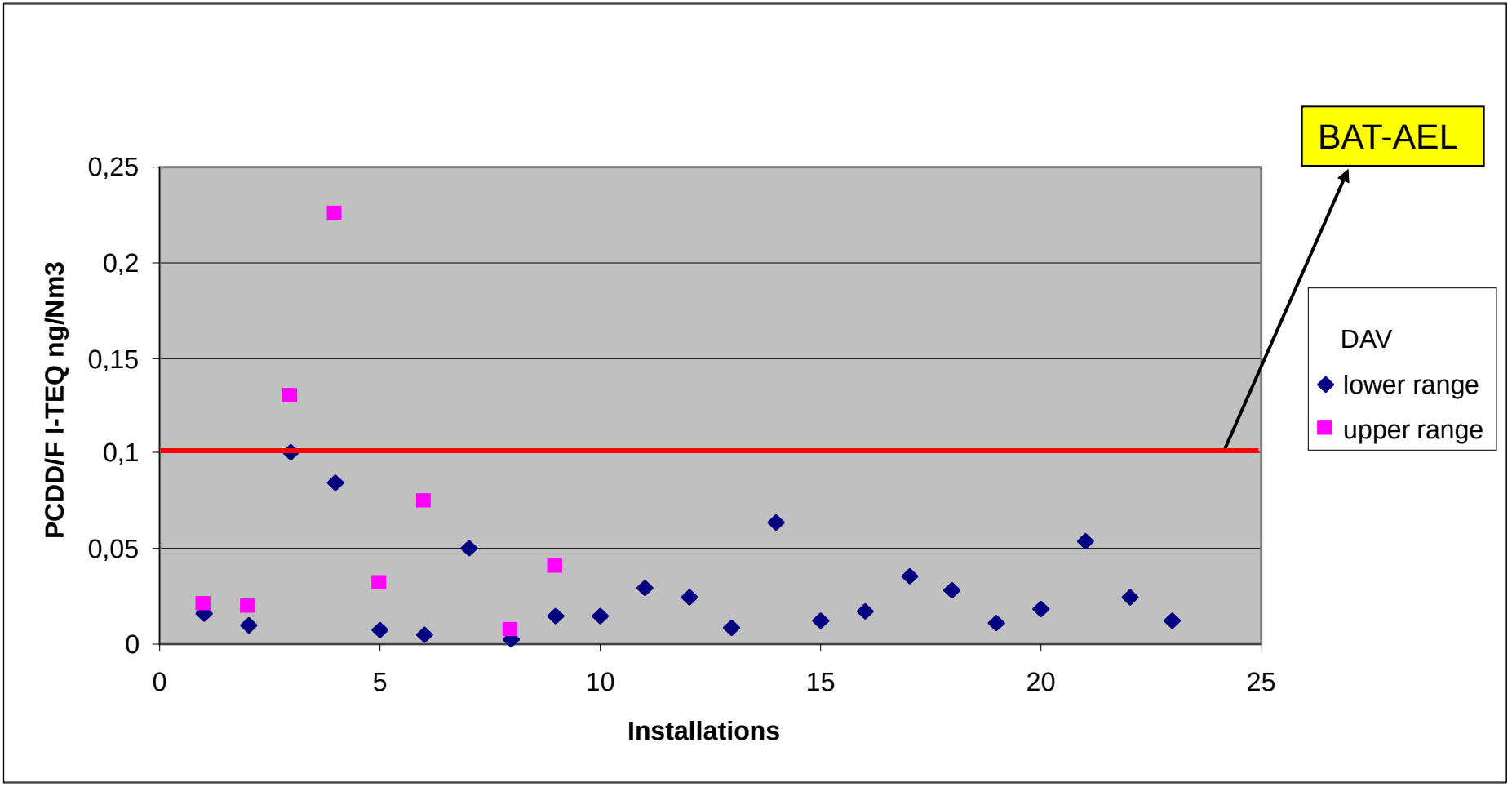
Daily averages for dust from an EAF over three years



Dust emissions from various EAF plants



Dioxin emissions from various EAF plants



BAT conclusion for dust emissions from the electric arc furnace

89. BAT for the electric arc furnace (EAF) primary and secondary dedusting (including scrap preheating, charging, melting, tapping, ladle furnace and secondary metallurgy) is to achieve an efficient extraction of dust emissions from all emission sources by using one of the techniques listed below and to use subsequent dedusting by means of a bag filter:

- **I. a combination of direct off-gas extraction (4th or 2nd hole) and hood systems**
- **II. direct gas extraction and doghouse systems**
- **III. direct gas extraction and total building evacuation (low-capacity electric arc furnaces (EAF) may not require direct gas extraction to achieve the same extraction efficiency).**

The overall average collection efficiency associated with BAT is >98 %.
The BAT-associated emission level for dust is <5 mg/Nm^3, determined as a daily mean value.

BAT conclusion for dioxin emissions from the electric arc furnace

90. BAT for the electric arc furnace (EAF) primary and secondary dedusting (including scrap preheating, charging, melting, tapping, ladle furnace and secondary metallurgy) is to prevent and reduce polychlorinated dibenzodioxins/furans (PCDD/F) and polychlorinated biphenyls (PCB) emissions by avoiding, as much as possible, raw materials which contain PCDD/F and PCB or their precursors (see BAT 6 and 7) and using one or a combination of the following techniques in conjunction with an appropriate dust removal system:

I. appropriate post-combustion

Applicability of BAT I: In existing plants, circumstances like available space, given off-gas duct system, etc. need to be taken into consideration for assessing the applicability.

II. appropriate rapid quenching

III. injection of adequate adsorption agents into the duct before dedusting.

The BAT-associated emission level for polychlorinated dibenzodioxins/furans (PCDD/F) is <0.1 ng I-TEQ/Nm^3, based on a 6 – 8 hour random sample during steady-state conditions. In some cases, the BAT-associated emission level can be achieved with primary measures only.

Concluding remarks

- The BREF process followed a defined and demanding exchange information process.
- Lot of information and expertise of many stakeholders from industry, Member States and NGOs were included.
- This BREF can be considered as a good description of the current best available techniques and their associated emission levels in the iron and steel production.
- It will be used as the reference for setting permit conditions where the BAT-AELs should not be exceeded.
- The revised BAT Reference Document for Iron and Steel Production can be considered a driver towards improved environmental performance.

All BREFs can be downloaded free of charge from the EIPPCB website

http://eippcb.jrc.es/reference/

Thank you for your attention

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