Technical report on sources in the metallurgical sector

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What are the questions I am about to adress?

Regarding the metallurgical sector:

§ Provisions of the two Aarhus Protocols (heavy metals - HM and persistent organic pollutants - POPs): are they consistent?

§ BATs: to what extent are they technically feasible?

§ BATs: to what extent are they techno-economically feasible?

§ Do BATs help in fulfilling the current HM Aarhus Protocol ELVs?

What are the documents I will refer to?

Regarding the metallurgical sector:

§ HM Aarhus Protocol: annexes II (categories), III (BATs) and V (ELVs)

§ POP Aarhus Protocol: annexes V (BATs) and VIII (categories)

§ BREFs developed under the EU IPPC directive (iron and steel, non-ferrous metals, smitheries and foundries)

§ « Assessments of technological developments: BATs and ELVs », report of the Task Force on Heavy Metals in the framework of the review of the Protocol (2006)

Metallurgical sectors covered by the Aarhus Protocol on heavy metals (HM) – annex II

Cat. 2 Metal ore or concentrate roasting or sintering installations with a capacity exceeding 150 t sinter/day from ferrous ore and 30 t sinter/day from Cu or Pb or Zn roasting or gold and mercury ore treatment

Cat. 3 Production of pig-iron steel (primary and secondary fusion) capacity > 2.5 t/hour

Cat. 4 Ferrous metal foundries, capacity > 20 t/day

Cat. 5 Production of Cu, Pb and Zn from ore or secondary raw materials, capacity > 30 t/day (primary) and > 15 t/day (secondary), or any primary production of Hg

Cat. 6 Installations for the smelting of Cu, Pb and Zn, capacity > 4 t/day (Pb) and > 20 t/day (Zn and Cu)

What are the categories also covered by the Aarhus Protocol on Persistent Organic Pollutants (POPs)?

HM Protocol		POP Protocol (annex VIII)
Primary iron and steel	→	category 2
Secondary iron and steel	→	category 4
Primary and secondary Cu	→	category 3
Primary and secondary Zn and Pb	→	not covered
Primary Hg and Au	→	not covered
Foundries	→	not covered

Best available techniques /BATs (annex III)

Primary iron and steel (para. 27-30)

Sinter plants, pellet plants, blast furnaces, basic oxygen furnaces.

« HM emissions depend on the composition of the raw material »

« Fabric filters should be used whenever possible; if conditions make this impossible, electrostatic precipitators (ESPs) and/or high-efficiency scrubbers may be used »

à These BATs are also BATs under the POP Protocol.

Best available techniques /BATs (annex III)

Secondary iron and steel (para. 31-33)

Electric arc furnaces.

« Capture all emissions efficiently » « by installing doghouses or movable hoods or by total building evacuation »

« HM emissions depend on the composition of the raw material »

« Dedusting in fabric filters shall be considered BAT »

à These BATs are also BATs under the POP Protocol.

Best available techniques /BATs (annex III)

Copper production (para. 40-41, 46)

Not directly adressed.

« fabric filters should be used where appropriate »

« In general, processes should be combined with an effective dust collecting device for both primary gases and fugitive emissions »

à These BATs are consistent with BATs of the POP Protocol.

BAT achievable emission levels and emission limit values – ELVs (annex V)

In the following slides:

ELV(1998) means ELVs in the current Protocol (annex V)

BATAEL(1998) means BAT achievable emission levels in the current Protocol (annex III)

BATAEL (2006) means BAT achievable emission levels identified by the Task Force in the 2006 review report

ELV(2006) means national ELVs identified by the Task Force in the 2006 review report

Emission values as mg/m3.

PM means « particulate matter ».

BAT AELs and ELVs – Primary iron and steel (1/2)

Sinter plants

PM ELV(1998) = 50 ; BATAEL(1998) = 20 (fabric filters) or 50 (ESPs)
BATAEL (2006) = 10-50; ELV(2006) = 20-150

Cd no ELV(1998)
ELV(2006) = 0.05-0.2

Pb no ELV(1998)
ELV(2006) = 0.5-5

Hg no ELV(1998)
ELV(2006) = 0.05-0.2

BAT AELs and ELVs – Primary iron and steel (2/2)

Blast furnaces

PM ELV(1998) = 50 ; BATAEL(1998) = 20 or 50

BATAEL (2006) = 1-15; ELV(2006) = 6.8-150

Cd, Hg, Pb no ELV(1998)

ELVs(2006) are proposed

Basic oxygen furnaces

PM no ELV(1998) ; BATAEL(1998) = 20 or 50

BATAEL (2006) = 5-30; ELV(2006) = 5-150

Cd, Hg, Pb no ELV(1998)

ELVs(2006) are proposed

BAT AELs and ELVs

Sedondary iron and steel

PM ELV(1998) = 20 ; BATAEL(1998) = 10-20

BATAEL (2006) = 5-15; ELV(2006) = 5-20

Cd, Hg, Pb ELVs(2006) are proposed (same as primary iron and steel)

Foundries

PM no ELV(1998) ; BATAEL(1998) = 20

BATAEL (2006) = 5-20; ELV(2006) = 2.3-50

Cd, Hg, Pb ELV(2006) are proposed (same as primary iron and steel)

BAT AELs and ELVs

Primary and secondary non ferrous production

Copper and zinc

PM ELV(1998) = 20 ; BATAEL(1998) = 10

BATAEL (2006) = 1-5; ELV(2006) = 1-50

Cd, Hg, Pb ELV(2006) are proposed (same as primary iron and steel)

Lead

PM ELV(1998) = 10 ; BATAEL(1998) = 10 or 5 (secondary lead)

BATAEL (2006) = 1-5; ELV(2006) = 1-50

Cd, Hg, Pb ELV(2006) are proposed (same as primary iron and steel)

Technically feasible?

Iron and steel / sinter plants

ESP widely used in the EU-27

Fabric filters, in conjunction with ESPs

Secondary steel / electric arc furnaces

Capture of diffuse emissions, ESPs and fabric filters, widely used in the EU-27

Non-ferrous production

Capture of diffuse emissions, ESPs and fabric filters, widely used in the EU-27

Techno-economically feasible? (1)

Some BATs can be costly

1. Fabric filters at sinter plants

Investment costs:

- Where flow rates are high, up to 20M euros
- 2-5 euros/t sinter

Operational costs: 0.5-2 euro/t sinter

2. Fabric filters at secondary lead production sites

In France, 4 sites made investments in 2000-01.

Maximum investment cost was 600.000 euros

Operational costs: 80-200.000 euros/year (major share = electrical consumption)

Techno-economically feasible? (2)

… but some BAT can generate money

1. Oxy-fuel burners (para. 43)

Case of a secondary aluminium plant in France where oxy-fuels burners were implemented, in conjunction with fabric filter and activated carbon injection.

New oxygen costs were balanced by gas savings

Productivity improvement à saving of 23 euro/t

2. Collected dust = metals that can be recovered and further processed or sold to other plants.

Secondary steel electric arc furnaces: collected dust is Zn rich

Techno-economically feasible? (3)

… but some BATs are good-value for the environment as a whole

The role of public financial incentive to help innovative projects (1)

In 2004, our agency funded fabric filter investments at ArcelorMittal Fos.
Driving force for funding decision:
§HM are transboundary pollutants but also local and regional pollutants.
§Innovative project
à ADEME funding was 3 M€
Thanks to BAT implementation, emissions were reduced by:

- 420 t/year for PM
- 5 t/year for lead
- 8 gI-TEQ/year for dioxins

Techno-economically feasible? (4)

The role of public financial incentive to help innovative projects (2)

In 2000-01, our agency funded dedusting investments at 4 secondary lead production sites.

Driving force for funding decision:

§HM are transboundary pollutants but also local and regional pollutants.

§Environmental and economical role of recycling activities

à ADEME funding was 30% of the investment costs.

Thanks to BAT implementation, achieved emissions were:

- 0.3 to 4.4 mg/m3 for PM
- 0.02 to 1.2 mg/m3 for lead
- < 0.025 mg/m3 for cadmium

Techno-economically feasible? (5)

Some reminders regarding metal exchange rates.

Case of copper.

1990-2003.	1500-3000 euro/t
January 2004.	2800 euro/t
January 2006.	4600 euro/t
Mid 2006-end 2008	7000 euro/t (peak at 8500 euro/t)
January 2009	3000 euro/t
October 2009	6200 euro/t

Lead and zinc production : similar trend

Conclusions related to the metallurgical sector

A very good consistency between the current HM and POP protocol BATs.

(Gothenburg Protocol: PM aspects are dealt in accordance with the HM Protocol review)

BATs in the current Protocol are very helpful in achieving the Protocol ELVs

BATs can seem costly, however there are several means to consider BATs less costly as they first seem…