FMP BREF implementation guidance

Disclaimer: The FMP BREF implementation guidance is a non-legally binding document. Only the texts of the Industrial Emissions Directive (2010/75/EU) and of the Commission Implementing Decision establishing the best available techniques (BAT) conclusions for the ferrous metals processing (FMP) industry (2022/2110) are legally binding. Neither EUROFER nor the authors or editors can be held liable for any incomplete or incorrect parts of this guidance.

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1. Introduction

This guidance document on the implementation of the FMP BREF has been drafted by a dedicated task-force and revised and completed by EUROFER's shadow working groups on the FMP BREF and by EUROFER's working group on Industrial Emissions.

The purpose of this guidance is to provide clarifications and interpretations when the BREF process and document is unclear or ambiguous (e.g., where mass flow calculation was not clearly defined in the data collection) as well as to support operators during the implementation process providing some insights on some non-exhaustive key issues.

This guidance can be seen as a two-way street: providing advice to operators for discussion with competent authorities on the one hand, and feeding EUROFER secretariat with information for future reviews of the FMP BREF on the other hand[1].

2. Legal background

The framework legislation

The Industrial Emissions Directive (2010/75/EU) is the key EU legislation for regulating emissions from industrial installations.

Around 50,000 installations fall under the activities described under Annex I of the IED and, as such, must operate according to the requirements of the directive, including the obligation to hold a permit (IED Art. 4(1)).

The main purpose of the IED is to "achieve a high level of protection of the environment as a whole" (IED Art. 1). The term 'as a whole' refers to the integrated approach to pollution prevention and control which commands that the whole environmental performance of the installation is considered in the permit.

To fulfil the purpose specified above, Best Available Techniques (BAT) Reference documents (BREFs), defined under the IED as "describing, in particular, applied techniques, present emissions and consumption levels, techniques considered for the determination of best available techniques as well as BAT conclusions and any emerging techniques […]", are developed for each industrial sector. A specific chapter of the BREF documents lays down the BAT conclusions, which are published as Commission Implementing Decisions, and become the reference for setting permit conditions (IED Art. 14(3)).

BAT conclusions (BATC) contain a number of conclusions on BAT (BAT-c). In the specific case of the FMP BREF, 63 BAT-c were identified, covering the following FMP subsectors: hot rolling,

[1] See FMP BREF Chapter 10, "Recommendations for future work" (p. 785), reproduced in Annex V of this guidance.

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cold rolling, wire drawing, hot dip coating and batch galvanising. A BAT-c consists of different elements of various legal nature:

- *Techniques listed in BAT-c*, including their description and information to assess their applicability, are neither prescriptive nor exhaustive. Other techniques may be used that ensure at least an equivalent level of environmental protection (see BREF guidance (2012/119/EU), section 3.1).
- *Emission levels associated with the best available techniques (BAT-AELs)* are binding according to IED Art. 15(3): "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) […]";
- *BAT Associated Environmental Performance Levels other than emission levels (BAT-AEPLs)* are only described in the Commission's BREF guidance (section 3.3.2.), which is not a legally-binding document.

IED Art. 21(3) provides the framework for reconsideration and updating of permit conditions when decisions on BAT conclusions are published:

"Within 4 years of publication of decisions on BAT conclusions in accordance with Article 13(5) relating to the main activity of an installation, the competent authority shall ensure that:

a) all the permit conditions for the installation concerned are reconsidered and, if necessary, updated to ensure compliance with this Directive, in particular, with Article 15(3) and (4), where applicable;
b) the installation complies with those permit conditions.

The reconsideration shall take into account all the new or updated BAT conclusions applicable to the installation and adopted in accordance with Article 13(5) since the permit was granted or last reconsidered."

According to the provisions above, the reconsideration of existing permits for installations where an activity covered by the FMP BREF is the main activity must take place between 4 November 2022 and 4 November 2026.

New installations which permits are issued after the publication of BAT conclusions must comply with the permit conditions immediately.

Ongoing revision of the Industrial Emissions Directive

A proposal for a revised Industrial Emissions Directive ('IED 2.0') was presented by the Commission on 5 April 2022. It is undergoing the ordinary legislative procedure and, as such, the publication of IED 2.0 is not expected before late 2023-early 2024. Member States would have 18 to 24 months to transpose IED 2.0, subject to the timeframe agreed in the new directive.

Against this background, it is likely that IED 2.0 will be implemented in Member States before the closing of the deadline for reviewing FMP permits. In summary, the following two situations can be distinguished:

– New permits / reconsideration of permits for existing plants between 4 November 2022 and the transposition of IED 2.0: the provisions of IED 1.0 (2010/75/EU) apply in full.
– New permits / reconsideration of permits for existing plants after the transposition of IED 2.0: it will depend on the inclusion of provisions ensuring the transition between IED 1.0 and 2.0 and exempting the application of certain provisions in the case of BAT conclusions adopted prior to IED 2.0.

In light of this uncertainty, it is crucial to raise the awareness of the national/local authorities on the fact that FMP BREF BAT conclusions have been derived under the principles of IED 1.0 and its related guidance (2012/119/EU). For example, when being derived, no particular attention was paid to the strictest end of the BAT-AEL range. Moreover, BAT-AEPL ranges were derived having in mind their indicative nature.

It results from the above that, when granting new permit or reconsidering permits for existing plants, the competent authority should read the FMP BREF BAT conclusions in light of IED 1.0. In the meantime, EUROFER is proposing amendments to IED 2.0 to ensure that it does not apply retroactively to the FMP BREF BAT conclusions.

3. Key messages and high-level recommendations

Scope

Q1. Can an activity not referred to in IED Annex I be covered by the FMP BREF?

A number of activities/processes are covered under the scope of the FMP BREF *as far as these activities are directly associated*[2] *with the activities listed in IED Annex I:*

- Cold rolling and wire drawing if directly associated with hot rolling and/or hot dip coating;
- Acid recovery, if directly associated with the activities covered by these BAT conclusions;
- The combined treatment of waste water from different origins, provided that the waste water treatment is not covered by Directive 91/271/EEC and that the main pollutant load originates from the activities covered by these BAT conclusions;
- Combustion processes directly associated with the activities covered by these BAT conclusions provided that:

[2] See IED Art. 3(3): "[…] 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."

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- the gaseous products of combustion are put into direct contact with material (such as direct feedstock heating or direct feedstock drying); or
- the radiant and/or conductive heat is transferred through a solid wall (indirect heating):
  - without using an intermediary heat transfer fluid (this includes heating of the galvanising kettle), or
  - when a gas (e.g. H2) acts as the intermediary heat transfer fluid in the case of batch annealing.

Standalone cold rolling and wire drawing plants are also covered under the scope of the FMP BREF as a surface treatment activity (Annex I 2.6), i.e., if the total volume of their treatment vats exceeds 30m^3.

Q2. How to understand the term ‘main pollutant load’ when assessing whether independently operated treatment of waste water or the combined treatment of waste water from different origins falls under the scope of the FMP BREF?

The ‘main pollutant load’ is a concept used when waste waters originating from *non-FMP sectors* are treated together with waste waters originating from one or more FMP sectors to determine whether such treatment is included (y/n) in the scope of the FMP BREF.

If the “main pollutant load originates from the activities covered by these BAT conclusions” (cf. FMP BREF scope), then the waste water treatment plant (WWTP) is considered a FMP plant in its own right and the FMP BREF BATC will apply.

NB: with regards to the combination of water streams from FMP and non-FMP sectors, the competent authority may need to take into account all relevant BATC for the setting of the permit conditions and to determine where the main pollutant load is coming from (e.g. IS BREF BATC, STS BREF BATC).

Whilst the contribution of the plant to the total load of each parameter at the monitoring point (in %) was requested during the data collection, not many plants provided this information. Therefore, a second stage of the data collection requested information on the volumetric contribution of FMP streams, in the form of one single value (%) for all parameters. This parameter was further used to derive BAT-AELs for emissions to water.

Chapter 7 of the FMP BREF therefore “contains information on the emissions to water from treatment plants processing waste waters originating from one FMP sector or originating from more than one FMP sector (common waste water treatment plants). Other streams from non-FMP sectors may be treated together, but this was only taken into consideration in this document when more than 50% of the volume streams originate from FMP processes.”

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Q3. Can plants operated by different legal entities be considered one single FMP installation?

The case may arise that one legal entity has been split in several ones, for e.g. when the waste water treatment part of the installation is handed over to an independent utility. This triggers a number of questions such as:

- can an installation be operated by several operators?
- can a single permit cover parts of an installation operated by different operators?
- does the existence of several operators affect the installation's layout?

Article 3(15) defines 'operator' as "any natural or legal person who operates or controls in whole or in part the installation or combustion plant, waste incineration plant or waste co-incineration plant or, where this is provided for in national law, to whom decisive economic power over the technical functioning of the installation or plant has been delegated".

According to the Q&A document on the IED produced by the Commission, the wording 'in whole or in part' clearly indicates that a single installation could be operated by two or more persons or companies[3]. This also follows from Article 4(3) which allows Member States to provide that a permit cover several parts of an installation operated by different operators. In such cases, the permit shall specify the responsibilities of each operator. This provision being optional however, Member States may also require that the responsibilities for the operation of an installation have to be attributed to one natural or legal person to facilitate the implementation of IED Art. 8 on non-compliance.

The Q&A document further specifies that the definition of the boundaries of an installation "is a purely technical matter", meaning that the way the installation is structured legally does not have any influence on these boundaries.

General considerations

Q4. What are the cases where measurements should not be normalised to the 3% oxygen reference level?

The general considerations of the FMP BREF BATC provide that, for combustion processes associated with feedstock heating and drying and heating of the galvanising kettle, BAT-AELs and indicative emission levels in the BAT conclusions were normalised to a standard O_2 reference level of 3 vol-%. For all other sources of emissions, no correction for the oxygen level was applied.

There are two specific cases where the normalisation to 3 vol-% is not applicable:

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[3] See IED Chapter 1 Q&A, available at https://circabc.europa.eu/ui/group/06f33a94-9829-4eee-b187-21bb783a0fbf/library/cd4fc56b-cb31-4a39-bed7-166a4e33e2d2/details

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- If the combustion process(es) use oxygen-enriched air or pure oxygen; or
- When additional air intake for safety reasons brings the oxygen level in the waste gas very close to 21 vol-%.

“Additional air intake for safety reasons” covers cases where the combustion gases may be mixed with ambient air to decrease the temperature and safeguard the integrity of the equipment (refractory, stack, etc.).

The correction factor to 3 vol-% using the formula included in the general considerations is exponential (see Annex II). This may lead to high inaccuracies when there are uncertainties with regards to the initial measurement. This is why, in the two cases above, the emission concentration is calculated differently, e.g. by normalising on the basis of the carbon dioxide generated by the combustion.

Annex 11.5 of the FMP BREF (“Combustion process(es) when using oxygen-enriched air or pure oxygen: normalisation based on the carbon dioxide generated during the combustion”) provides the details of the alternate formula based on the carbon dioxide generated by the combustion.

Q5. How have mass flows been defined for BAT-AEL and monitoring requirements?

The FMP BREF includes several mass flow thresholds associated with BAT-AELs for emissions to air, i.e. BAT 20 (dust), for monitoring of emissions to air, i.e. BAT 7 dust > 2kg/h, NO_x > 15kg/h and SO_2 > 10kg/h and for applicability of techniques, i.e. BAT 43 (water sprays) and BAT 42 (air extraction as close as possible to the emission source).

The following definition of mass flow is given in the general considerations: “the mass of a given substance or parameter which is emitted over a defined period of time”. However, there is no standardised methodology or approach to determine/calculate mass flow values or to monitor the waste gas flow. This was acknowledged in the concluding remarks of the Commission during a workshop focused on mass flow approaches in national legislation, permits and BAT conclusions hosted by UBA Austria on 13 October 2022.

Against this background, existing local rules may be applied considering the normal practice followed by operators and competent authorities.

Q6. Where do the BAT-AELs for emissions to water apply?

According to the general considerations, the BAT-AELs for emissions to water “apply at the point where the emission leaves the plant”.

‘Plant’ is defined in the BAT conclusions as “all parts of an installation covered by the scope of these BAT conclusions, and any other directly associated activities which have an effect on consumption and/or emissions. Plants may be new or existing plants”. The EIPPCB clarified

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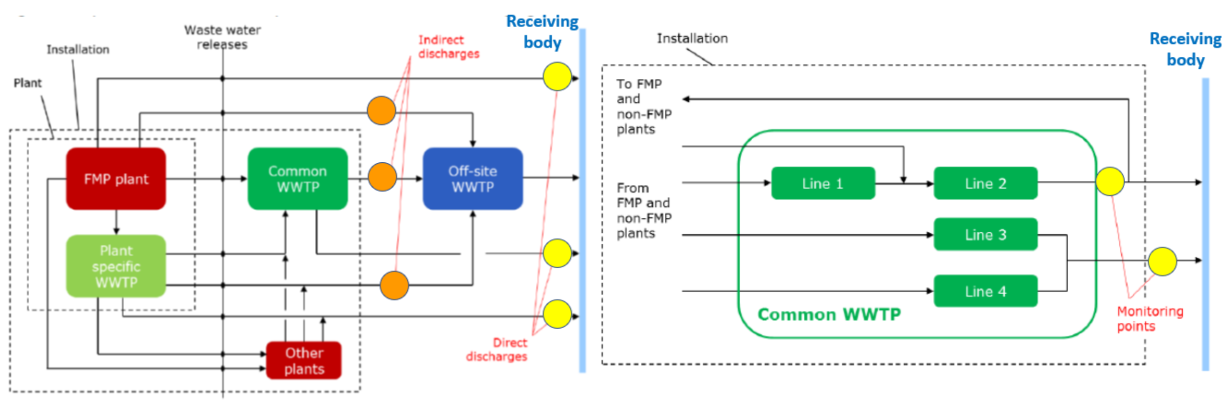
during the BREF review that, in the FMP context, the term ‘plant’ is used as an equivalent to ‘installation’[4].

As per the explanation above, monitoring and BAT-AEL requirements apply at the point where waters leave the installation.

The two figures below, also reproduced in Annex 11.2 of the FMP BREF ("Explanation of emission point identification”), give a clear overview by locating *direct discharges*, i.e. leaving the installation to the receiving body and *indirect discharges*, i.e. leaving the installation to the downstream water treatment plant offsite.

Monitoring and BAT-AELs water to:
receiving body (direct discharge) or Off-site WWTP (indirect discharge)



Waste water release: Any stream (or sum of streams) of waste waters leaving the plant towards a destination. (e.g. a receiving body (direct discharge), an off-site WWTP (indirect discharge), another plant (for recycling) or an on-site common WWTP).

Monitoring requirements and BAT-AELs are applicable ONLY to:
- releases to a receiving body (direct discharge)
- releases to an off-site WWTP (indirect discharge)

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Q7. What are the cases when BAT-AELs for indirect emissions to water do not apply?

Footnote 2 to table 1.21 under BAT 31 specifies that the BAT-AELs for emissions to water “may not apply if the downstream waste water treatment plant is designed and equipped appropriately to abate the pollutants concerned, provided this does not lead to a higher level of pollution in the environment.” Similarly, footnote 5 under BAT 8 (monitoring) reads: “In the case of an indirect discharge to a receiving water body, the monitoring frequency may be reduced to once every 3 months if the downstream waste water treatment plant is designed and equipped appropriately to abate the pollutants concerned.”

[4] Compiled comments (March 2020) with EIPPCB assessment – EIPPCB assessment of a comment on BAT-AELs for emissions to water: “In FMP the term of plant is used as an equivalent to installation. Plant covers also a CWWTP (All parts of an installation covered by the scope).”

Whether or not BAT-AELs for indirect emissions to water will apply when the FMP plant is connected to a downstream WWTP is left to the interpretation on a case-by-case basis by the competent authorities and the operator.

However, the list of techniques described in Section 8.9 of the FMP BREF ("General techniques to reduce emissions to water”) could be used to identify the techniques implemented in the downstream WWTP for the pollutants at stake and, hence, support whether or not the “downstream waste water treatment plant is designed and equipped appropriately to abate the pollutants concerned”.

Similarly, the condition that the indirect discharge should not lead to a higher level of pollution in the environment may be demonstrated if the concentration of pollutants to the receiving body from the downstream WWTP are not influenced by the input waters from the FMP installation.

Q8. When several wastewater streams from different processes are combined before they leave the installation, are the BAT-AELs applied to the common stream or to the each wastewater stream separately?

The water streams and flows may differ from one to another operator as the local configuration can be different. There is no requirement in the FMP BREF BAT conclusions or in the IED to apply BAT-AELs to separate water streams, although any dilution technique is prohibited (see IED Art. 15(1)). As a result, several streams pertaining to the FMP installation may be combined before leaving the installation, where the BAT-AELs would apply.

General and sector-specific BAT conclusions

Q10. Are there any applicability restrictions to the use of electricity from fossil-free energy sources?

In the reviewed FMP BREF, it is now BAT to use electricity generated from fossil-free energy sources in heating processes, alongside other BATs related to combustion processes. This technique was added in the BAT conclusions during the Final Meeting, although, at the time of the meeting, no description of the technique was included in the descriptive chapters of the BREF. It is only when the Article 13 Forum convened to establish its opinion on the final draft of the FMP BREF that the decision was taken to introduce a description of the technique. Therefore, issues relevant to applicability were only discussed at a very late stage of the process, which prevented from adding applicability considerations in the BAT conclusions.

Against this background, <u>the use of electricity generated from fossil-free energy sources in heating processes shall not be considered as *generally applicable*</u>. Applicability restrictions (i.e. technical considerations, economics and cross-media effects) are described in Section 8.8.2.1 of the FMP BREF.

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Q11. What is the rationale for introducing BAT-AELs for dust in case of furnaces operating with 100% natural gas?

The entrainment of dust from sources other than combustion (e.g., material oxides, refractory particles) was suggested to explain dust emissions observed when natural gas is used for heating in the data collection. Conversely, certain furnace conditions (e.g., low gas flows) and certain types of feedstock (e.g. stainless steel, where the scale is more tightly bound) prevent relevant amounts of dust particles to reach the stack.

The EIPPCB proposed several techniques to limit the entrainment of dust (clean feedstock, minimising dust generation from refractory lining damage, avoiding direct contact of the flame with the feedstock) to justify the applicability of the BAT-AEL range to heating with natural gas.

However, it is worth noting that these techniques were not identified in the data collection. As such, no link is established between their use and observed emission reductions.

The data collection showed that emissions of dust from heating with natural gas generally correspond to lower mass flows than for other fuels and are insignificant compared to other emission sources. As such, it may be possible to be exempted from the application of the BAT-AEL range (footnote 1 under table 1.7) and/or apply lower monitoring frequencies (see BAT 7).

Q12. Can NO_x emissions exceed the BAT-AEL ranges when applying air preheating?

Air preheating techniques are recognised as BAT in order to significantly reduce energy consumption (see BAT 11(m)). At the same time, the limitation of air preheating temperature is BAT in order to reduce NO_x concentrations (see BAT 22(f)). However, whilst having a positive effect on NO_x concentrations, limiting air preheating implies that more fuel would be needed to keep the same production level. As a result, for the same production level, NO_x mass flows may not always decrease.

Therefore, the effect of limiting air preheating temperature is highly questionable, in particular when considering the core objective of the IED to “achieve a high level of protection of the environment *taken as a whole*”. Indeed, the trade-offs related to increased fuel use and emissions may be considered disproportionate compared to the higher NO_x concentrations induced by the air preheating technique.

Throughout the FMP BREF review, EUROFER has produced a significant body of evidence demonstrating that the application of air preheating results in increased NO_x emissions to support increased BAT-AELs when air preheating is applied. This evidence concerns reheating, intermediate heating and post heating furnaces in hot rolling, batch annealing furnaces in cold rolling and furnaces in hot dip coating and is summarised in EUROFER’s paper titled ‘FMP BREF Final Meeting: Summary of submitted evidence on air preheating and NOx emissions’ (see Annex III).

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The EIPPCB acknowledged this evidence, among others, by proposing a slight increase in the upper-end of the BAT-AEL range for existing reheating furnaces using 100% natural gas in HR (from 300 to 350 mg/Nm^3) and by confirming most of the split views recorded by EUROFER on the issue (see Chapter 10 of the FMP BREF). In some cases, other TWG members also acknowledged the relationship between higher process/preheating temperatures, increased NOx emissions and higher energy efficiencies. For example, a sample calculation provided by a Member State showed a 1:180 NOx/CO2 ratio when reduced air preheating is applied in batch annealing.

Whilst the split views are recorded in a descriptive, non-binding, chapter of the FMP BREF, they reflect the lack of consensus of the TWG on some issues. Each split view has to be supported by a valid rationale, i.e. supported by appropriate technical, cross-media or economic data or information relevant to the definition of BAT. The EIPPCB's split view assessment report annexed to this guidance reflects EUROFER's rationale supporting the split views (see Annex IV).

Q13. How should the term 'enclosed areas' in BAT 28-33-36-55 be understood?

It is worth noting that, the same word 'enclosed areas' used in BAT 28-33-36-55 is sometimes translated differently depending on the BAT at stake. Sometimes, the word 'enclosed areas' is translated as an enclosed building or as either completely enclosed or not completely enclosed.

The wording 'area' used in previous BREFs (see, for e.g., section 4.5.1.2 of the Waste Treatment BREF) shows that it has a wider meaning than that of an enclosed building.

The context of the BAT conclusion may also help assess whether 'enclosed' refers to a completely or not completely enclosed area. For example, BAT 36 requires fabric filter dust originating from zinc-containing residues from hot dipping to be stored in enclosed areas AND in closed container/bags. There were discussions in the final meeting whether the term and or or was most appropriate. Therefore, it may be appropriate in this specific case to consider the wording 'enclosed area' as not completely enclosed.

Q14. Is there any available information on the use of the described BATs in the respective FMP sub-sectors?

Whilst EUROFER argued that the applicability column of BAT conclusions should include information on the relevance of techniques to the various FMP sub-sectors (HR, CR, HDC etc.), the position of the EIPPCB is that the inclusion of information on sector relevance in the BAT conclusions may restrict their application in the future. As such, a compromise was reached on including in Annex 11.4 of the FMP BREF information summarising, at the time of writing, in which sub-sector the techniques mentioned in the BAT conclusions are used.

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Annex I: The FMP BREF review process

On 27 November 2015, the Technical Working Group (TWG) for the review of the FMP BREF adopted in 2001 was reactivated. This marked the first step of the FMP BREF review process, which can be summarised as follows:

- The Kick-off meeting (KoM) of the FMP BREF TWG took place from 15 to 18 November 2016. The report of the KoM was published on 17 March 2017 and contains the conclusions reached at the meeting, in particular on key environmental issues (KEIs) identified for the BREF review.
- The publication of the finalised questionnaires for well-performing plants and the launch of the data collection took place on 10 November 2017, following a testing phase in a selected number of plants. The data collection took place between 10 November 2017 and 20 April 2018.
- An additional data collection was performed to collect missing information via gap tables between 29 November 2018 and 31 January 2019.
- A first data assessment workshop took place on 23-24 January 2019. As a follow-up to the workshop, “data tables” were issued for collection/correction of data not covered by gap tables.
    - *Post-assessment by EIPPCB:* the use of gap and data tables were not the most efficient instrument to complete/correct information contained in the questionnaires.
- The first draft (D1) of the FMP BREF was published on 29 March 2019. A commenting period followed, until 7 June 2019.
- Revised questionnaires were published on 24 April 2019 containing changes, additions and corrections made by the EIPPCB or via gap and data tables.
- A second data assessment workshop took place on 3-4 December 2019.
- A background paper (BP) and revised BAT conclusions were published on 31 January 2020, outlining the main issues and proposals from the EIPPCB to be discussed at the Final meeting (FM) of the TWG. A commenting period on the revised BAT conclusions followed, until 20 March 2020.
- A revised version of the FMP BREF D1 was published on 17 July 2020, with main changes concerning essentially sections X.3 (current consumption and emission levels) and X.4 (techniques to consider in the determination of BAT) of the BREF.
- Given the outbreak of Covid-19, the final meeting, initially foreseen as a physical meeting, was delayed and took place in the form of a written consultation on all BAT conclusions, 2 web-based meetings (on 23 and 26 November 2020) to conclude on issues that do not appear to be too controversial and 7 web-based meetings on the more controversial issues from 10 December 2020 to 8 February 2021.

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- In view of the written consultation, an updated version of the BATC was published on 9 October 2020 and the written consultation ran until 6 November 2020.
- During the final meeting, EUROFER registered 8 split views on BAT 10 and BAT 20 and confirmed them on 27 February 2021.
- A Pre-Final Draft of the FMP BREF was published for comments on 23 June 2021, reflecting decisions taken at the final meeting as well as changes resulting from additional information received from TWG members during the preparation of after the FM.
- A Final Draft (FD) of the FMP BREF was subsequently published on 14 October 2021, as a basis for forming the opinion of the IED Article 13 Forum. A commenting period followed, until 23 November.
- The meeting of the Article 13 Forum took place on 17 December 2021 to form an opinion on the FMP BREF document as a whole. One issue was proposed for discussion, i.e. the definition of the use of electricity from fossil-free energy sources as BAT. A consensus was found on the EIPPCB proposal to introduce in the BREF chapter for BAT candidates a short description of the technique, taking into account the current experience of use of electrical furnaces in the FMP sector.
- A final version of the BAT candidate was presented by the EIPPCB on 27 April 2022 for integration in the final version of the BREF.
- Member States delivered a positive opinion on the BAT conclusions on 17 June 2022.
- Subsequently, the BAT conclusions were published in the Official Journal of the EU on 4 November 2022, in all 24 official languages of the EU.
- The final version of the FMP BREF as a whole was published on 12 December 2022, in English only. It can be downloaded here: https://publications.jrc.ec.europa.eu/repository/handle/JRC131649.

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Annex II: The impact on emission levels by adjusting to 3% O2 (part of EUROFER comments to key topics listed for FMP 2nd EIPPCB data workshop)

For the cases where a reference oxygen level is given, the equation for calculating the emission concentration at the reference oxygen level is (p714 FMP Draft_1):

$E_R = (21 – O_R)/(21 – O_M) \times E_M$

where:

E_R: emission concentration at the reference oxygen level O_R;

O_R: reference oxygen level in vol-%;

E_M: measured emission concentration;

O_M: measured oxygen level in vol-%.

For O_R of 3% vol O_2 and an E_M of 1 (any unit) the following table and figure can be constructed:

O_M	Multiplication factor for E_M	O_M	Multiplication factor for E_M
0	0.86	18	6
3	1	19	9
6	1.2	20	18
9	1.5	20.5	36
12	2	20.9	180
15	3	20.95	360

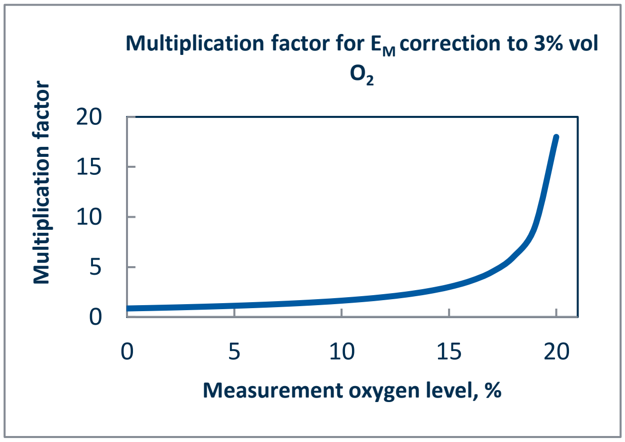

Table of multiplication factors for different waste gas oxygen levels referred to a 3% vol oxygen level and figure illustrating the exponential growth nature of the relationship in the equation

For measured oxygen levels around the 3% O_2 the corrections are relatively small up to about 6% O_2, but it is apparent from the table and figure above the disproportionate impact the correction has on the amount of any emission species at higher measured oxygen levels. For example a measurement of dust of 6 mg/Nm³ at 18% O_2 would be adjusted to 36 mg/Nm³ at 3% O_2.

It should also be considered that any error or inaccuracy in the measurement of any species would also be magnified by the same multiplication factors for measurements at the higher oxygen levels.

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Annex III: FMP BREF Final Meeting: Summary of submitted evidence on air preheating and NO_x emissions

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Summary

This document aims to summarise the arguments provided by EUROFER and other TWG members agreeing that higher NO_x levels are needed when air preheating techniques are applied. The correlation between air preheating temperature and NO_x emissions has been discussed in detail throughout the review and is acknowledged in the FMP BREF revised D1. However, its benefits on the environment as a whole have only been recognised to a very limited extent so far.

The specific impact of air preheating temperature on NO_x emissions was already acknowledged in the previous FMP BREF document (2001)[1]. In the case of operators using the technique of limiting air preheating this will not automatically decrease NO_x mass emissions. Limited air preheating must be compensated by use of additional fuel for heating of ambient air which counteracts the positive effect of reduced NO_x concentration.

Air preheating has by far the largest positive effect on specific energy consumption. Information provided in the FMP BREF revised D1 demonstrates that up to 60% energy savings can be achieved[2]. In turn the energy savings reduce emissions of dust, SO_2, CO and CO_2. However, in its present form, the FMP BREF BATC (October 2020) only includes an applicability restriction for the use of air preheating related to the need to control NO_x emissions and not to energy use. Given the positive cross-media benefits of air preheating, a recognition of the negative consequences of limiting air preheating should equally be laid down in the BATC (BAT 20).

Many existing plants are currently equipped with air preheating equipment. These plants will struggle to implement techniques to reduce NO_x emissions or end-of-pipe techniques because many of these techniques cannot effectively be implemented alongside tube burners. Even limiting air preheating will in some instances be impossible due to, e.g. burner design or technical constraints in the flue gas channel.

Based on the above, the current BAT-AELs for NO_x emissions do not take into account the limited options that operators of existing plants using air preheating have to reduce NO_x emissions.

Finally, the current BAT-AELs fail to recognise that NO_x emissions are unrelated to the sector (HR, CR, HDC, BG) or the heating process (reheating, intermediate heating, post-heating) but are based on the temperature of the process.

The following chapters provide with detailed explanations of the above, with appropriate reference to the supporting input submitted throughout the review process. Taking this input and supporting comments made by TWG members[3] into account, the proposed upper-ends of

[1] Reference Document on Best Available Techniques in the Ferrous Metals Processing Industry 2001; page: ii, iv, x, xiv, 119, 226-227, 233, 315, https://eippcb.jrc.ec.europa.eu/sites/default/files/2019-11/fmp_bref_1201.pdf
[2] FMP_revised_Draft_1.pdf, p.551, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showForum&forumID=131405
[3] Compiled comments (March 2020) with EIPPCB assessment.xlsx, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showPost&forumID=129988&postID=131729

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the BAT-AEL ranges for BAT 20 should be amended acknowledging higher NO_x emission limits when using air preheating.

Background

General information

The FMP BREF document and associated BAT conclusions are being reviewed since the last 5 years. During this time, new information has been shared on NO_x emissions from combustion processes. Both industry and Member States have submitted such information and part of it has been included in the FMP BREF revised D1[4]. The information submitted into BATIS over this 5-year period is extensive, in particular with regards to factors influencing NO_x emissions e.g. correlation to air preheating, use of fuel, recuperative and regenerative burner techniques and heat treatment. A substantial share of submitted and uploaded information gives information on higher NO_x emissions relating to air preheating.

The purpose of this document is to give a summary of the information on NO_x emissions and air preheating uploaded into BATIS and presented in the FMP BREF revised D1. Since there is a direct relationship between energy savings, air preheating and NO_x emissions, the first chapters relate to this subject. Technical applicability constraints are also addressed in these first chapters, e.g. chapter *BAT 20 – Available Techniques and Applicability constraints in relation to air preheating*. In the chapter on *NO_x emissions*, several examples of heat treatment processes resulting in higher NO_x concentration than the proposed BAT-AELs are presented for several FMP subsectors (HR, CR, HDC).

Air Preheating, energy savings and NO_x emissions

When analysing emission data for NO_x in relation to air preheating temperature there is one thing of high importance, **waste gas temperature**. In turn the waste gas temperature is indirectly linked to the heat treatment process. Temperature of the waste gas (the outgoing energy flow) will limit to which temperature you can preheat the incoming combustion air (ingoing energy flow). Since energy cannot be destroyed but only transformed into different forms, temperature of the preheated air will always be below the temperature of the waste gas (due to thermal efficiency of the air preheating technique)[5].

The temperature of the waste gas will transfer its heat to the material in the furnace, either directly using open flame burners, or indirectly using radiant tube burners. Simplified this will imply that in lower temperature heating processes, i.e. various low temperature heating and annealing (material heated to < 600 - 700 °C), temperature of the waste gases will restrict the air

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Revised Draft FMP BAT Conclusions OCTOBER 2020.pdf, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showForum&forumID=131723

[4] FMP_revised_Draft_1.pdf, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showForum&forumID=131405
[5] FMP_revised_Draft_1.pdf, p.551

preheating temperature to below e.g. < 400 °C and in turn the concentration of NO_x in the waste gases will be lower. As the temperature of the heated material increases, this will also increase the temperature of the waste gases, and in turn the heat transfer to incoming combustion air will increase resulting in higher air preheating temperature.

The effects of different heat treatment processes, air preheating temperature, and NO_x emissions have been illustrated in collected data and supporting documents uploaded in BATIS. It should be noted that this relationship can be non-linear, as illustrated by figures 8.40, 8.43 and 8.44 of the FMP BREF revised D1.

NO_x emissions depend not only on air preheating temperature, but also on other factors (e.g. FMP sector, type and design of the furnace, type of burner, type of fuel, type of feedstock, conditions of operation of the furnace, etc.). However, all things being equal, when observing one furnace or a group of similar furnaces in the same sector operating in similar conditions, then a clear and significant correlation is demonstrated between air preheating temperature and NO_x emissions.

In submitted documents shared by other TWG members, the correlation between air preheating and NO_x emissions has been illustrated in Post Heat-Treatment[6]. This information is shown in figure 2.41 of the FMP BREF revised D1[7]. When the feedstock (i.e. heavy plate) is heated above 900 °C, the air preheating temperature is > 400 °C and the NO_x concentration reaches > 700 mg/Nm^3 ref. O_2 3 % (fuel, COG).

So, what this actually implies is that when using air preheating techniques, as you increase the burner power (fuel input in the burners), the waste gas temperature will increase resulting in higher air preheating temperature and NO_x emissions. As such, when using air preheating, the outcome of NO_x concentration in the waste gas in a single measurement depends mainly on the power of the burner at time of measurement. EUROFER[8] and other TWG members[9] have provided and uploaded information into BATIS on the relationship between burner power and NO_x emissions.

In the information provided by EUROFER, *"NO_x test in ArcelorMittal.pdf"*, relationship between burner power, air preheating temperature, and NO_x concentration is examined for radiant tube burner. As the burner power increases from 23 to 75 – 100 %, air preheating temperature and NO_x concentration increases to approx. 350 °C and 500 mg/Nm^3 ref. O_2 3 %. The relationship is illustrated below.

[6] SSAB Oxelösund – Presentation Hot Rolling Mill.pdf, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showPost&forumID=123841&postID=124087
[7] FMP_revised_Draft_1.pdf, p.53
[8] NOx test in ArcelorMittal.pdf, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showPost&forumID=132013&postID=131719
[9] See, for example, SE Template comments_ BATC (Oct 2020).xlsx, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showPost&forumID=131724&postID=131989

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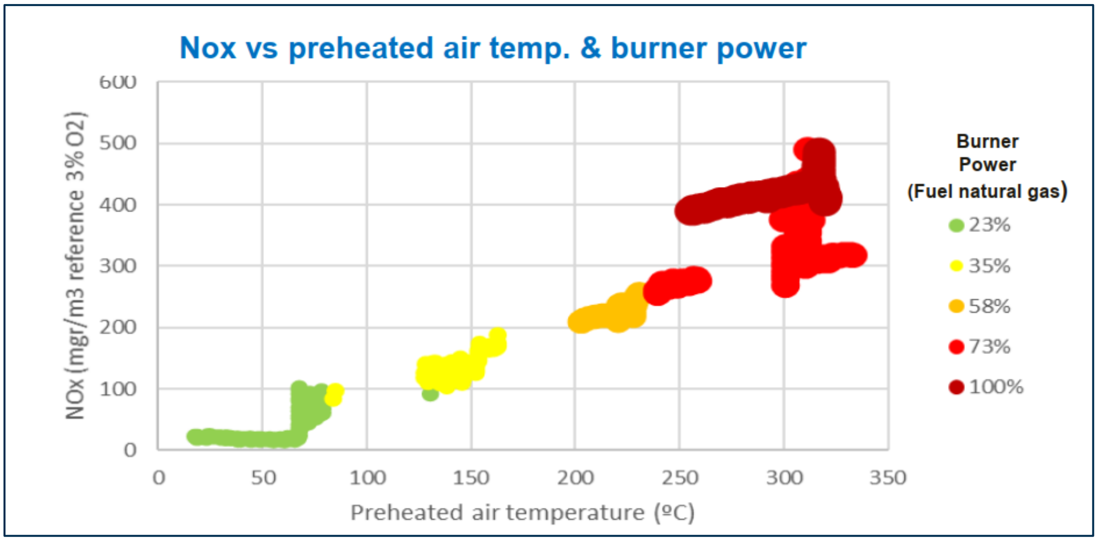
Figure 1. Relationship between the temperature of the preheated air, burner power and NO_x generation

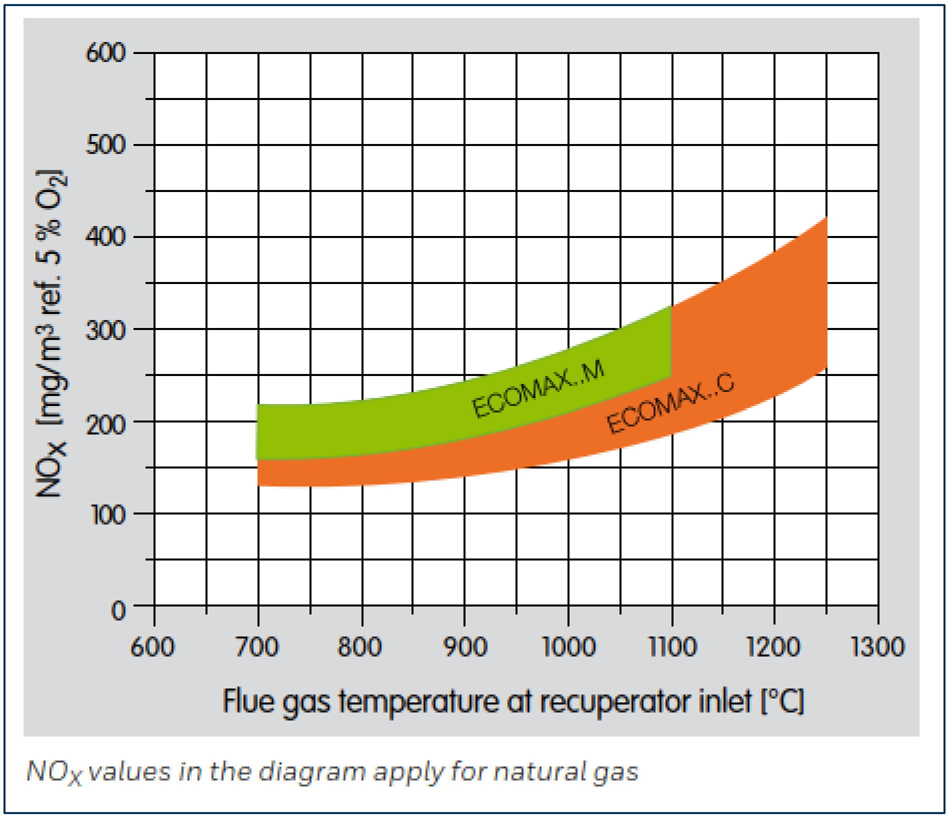


Reference: NO_x test in ArcelorMittal.pdf,

Supporting information on the relationship between burner power and NO_x emissions has also been submitted by other TWG members[10], referring to technical documentation made public and accessible by suppliers of recuperative burners[11]. Figure 2 below illustrates the same figure as given in the technical presentation given by Kromshroeder ECOMAX recuperative burner[12]. As the power of the burner is increased (higher waste gas temperature before inlet), NO_x concentration in the flue gases will rise to levels between approx. 280 - 450 mg/Nm^3 @ 3 % O_2.

[10] Ibid
[11] Honeywell - Kromshroeder recuperative burner, ECOMAX, https://docuthek.kromschroeder.com/documents/download.php?lang=en&doc=59783
Industrial Burner Systems - Recufire M 400, https://www.ibs-brenner.de/Industriebrenner_Stand_2020/IBS_Recufire_M_400_D_GB.pdf
[12] Honeywell - Kromshroeder recuperative burner, ECOMAX, p.61 https://docuthek.kromschroeder.com/documents/download.php?lang=en&doc=59783

Figure 2. Honeywell - Kromshroeder recuperative tube burner, ECOMAX



Reference: Honeywell - Kromshroeder recuperative burner, ECOMAX, [*https://docuthek.kromschroeder.com/documents/download.php?lang=en&doc=59783*](https://docuthek.kromschroeder.com/documents/download.php?lang=en&doc=59783)

Cross media effects – BAT 10 (energy) and BAT 20 (NO_x)

Measures to avoid emissions from combustion processes can be achieved by using techniques relating to preventing specific emissions, e.g. NO_x. To reduce NO_x emissions, BAT 20 proposes the use of techniques a – k. However, avoiding emissions from combustion processes on a general basis for all pollutants will also be fulfilled by achieving a high energy-efficiency in your combustion process (reduced fuel consumption).

In BAT 10 of the revised draft of the BAT-conclusions, 13 various techniques a – k have been presented as to increase energy efficiency in heating[13]. The proposed techniques to increase energy efficiency is divided into: *design and operation,* and *heat recovery from flue-gases*. The possibility to use these techniques are in some cases constrained to specific processes, i.e. technique **b** (galvanizing), **e** (I&S), **f** (BG), **f1-f2** (not applicable in radiant tube application), **g** (slab

[13] Revised Draft FMP BAT Conclusions OCTOBER 2020.pdf, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showForum&forumID=131723

re-heating), **h** (fluxing). It's also worth noting that some of the proposed techniques **e** and **k** only have an effect on the "overall" energy efficiency in a plant (if used within the plant) and not the specific energy consumption for a given furnace (MJ/t). In previous submissions, TWG members also pointed out that some techniques (**f3**) are missing relevant information regarding the possibility to reduce energy consumption, and it is more likely that the reduced energy in reference data from technique **f3** is due to air preheating[14].

Out of the presented techniques generally applicable, **"*Preheating of combustion air*" is the technique having by far the largest impact on the specific energy consumption**. As a "rule of thumb", for an increase of 100 °C in air preheating you will achieve a 5 % reduced energy consumption. The reduced consumption of energy is a result of avoiding the additional needed fuel used to heat combustion air from ambient temperature.

An example of energy savings in relation to air preheating has been illustrated in figure 8.9 of the FMP BREF revised D1 and shows that up to 60% energy savings can be achieved[15].

Moreover, less energy used in the furnace per ton of heated material (MJ/t) reduces mass emissions of all pollutants (dust, SO_2, CO, CO_2).

Different techniques are used for preheating of combustion air: recuperator, recuperative burners (open flame or radiant tube), and regenerative burners (open flame or radiant tube). The techniques of regenerative burners (up to 1100 °C) and recuperative burners (up to 600 – 700 °C) achieve higher air preheating than a single recuperator (approx. 550 °C) in the waste gas outlet[16].

The data collection clearly shows that **a vast majority of existing plants** apply the air preheating technique[17].

When analysing emission data from Hot Rolling uploaded into BATIS, *"01a-HR air emissions data tables.xlsx"*[18], data for air preheating gives an average of 400 °C (equivalent to 20% in reduced fuel consumption). As a vast majority of the operators use techniques for air preheating with an average temperature of 400 °C, it's reasonable to assume that this will have a strong influence on any obtained BAT-AEPLs for energy consumption (MJ/t). Conversely, limiting the temperature of air preheating (BAT 20, technique f), or not using air preheating at all, will most certainly result in that any energy BAT-AEPLs will not be possible to achieve for combustion processes. In other words, it cannot be assumed that all plants limiting their air preheating to comply with the current BAT-AEL range for NO_x, will equally be able to achieve the energy BAT-AEPLs.

[14] SE BATIS_comments_spreadsheet.xlsx, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showPost&forumID=131405&postID=132068
[15] FMP_revised_Draft_1.pdf, p.548
[16] FMP_revised_Draft_1.pdf, p.551-552
[17] a-Figures emissions to air all sectors.pdf, p.20-23, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showPost&forumID=129987&postID=132079
[18] 01a-HR air emissions data tables.xlsx, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showPost&forumID=129987&postID=130005

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BAT 20 – Available Techniques and Applicability constraints in relation to air preheating

As has been illustrated in the previous chapters, air preheating increases the NO_x concentration in the flue gas. As shown by the collected data, techniques to preheat combustion air are used by a vast majority of the operators. In BAT 20 technique a – k are proposed as measures to reduce NO_x from heating. Techniques are divided into either *"reduction of generation of emissions",* or as end of pipe reduction measures *"waste gas treatments"* (i.e. SCR and SNCR). In case an operator using preheated combustion air can´t cope with the proposed BAT-AELs, its seems at first glance that there is a bundle of techniques to choose from. However, this **is not correct** and the reasons are the following.

- When using a recuperative or regenerative tube burner, the combustion takes place in a confined space optimised to transfer heat from the waste gases to the radiant tube. This restricts the possibility to use several of the proposed techniques (g, h, i, j). Information has been submitted by EUROFER[19][20] and other TWG members[21].
- Flameless combustion (technique g) is different from ordinary combustion conditions in those senses that the flame volume becomes bigger and flame temperature will be lower. In real furnaces, flame-less conditions are usually met with fluid dynamic techniques using special burners or arrangements of fuel and air/oxygen inlets. Therefore, the confined space of tube burners will restrict the possibility to create such fluid dynamics.
- Oxy-fuel (technique h) has not been proven to be used in confined spaces as in radiant tube or bell annealing furnace application. Major consideration is due to space limitations as the limited space (tube) does not allow for dilution of incoming fuel and oxygen which creates very high peak temperatures. The lacking possibility to suppress high peak temperature results in material fatigue. For this reason oxy-fuel is not used on a commercial scale for tube burners.
- When using SCR or SNCR (technique i and j) it is critical for the waste gas to be within the temperature window of these techniques (SCR, 300 – 450 °C; and SNCR 800 – 1000 °C). Several TWG members have pointed out applicability constraints in relation to waste gas temperature[22]. SNCR technique is not used in tube burners since it is a closed unit without the possibility to inject ammonia. When the waste gases leave the burner at waste gas outlet (Figure 8.11 of the FMP BREF revised D1), temperature will be below the proper

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[19] Revised techniques 2.4.2.5-2.4.2.6-2.4.2.7.docx, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showPost&forumID=132013&postID=130200
[20] Reasoning 2.4.2.5-2.4.2.6-2.4.2.7.docx, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showPost&forumID=132013&postID=130200
[21] See, for example, SE Revised BAT techniques (2.4.2.5, 2.4.2.6, 2.4.2.7) 200320.docx, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showPost&forumID=132013&postID=130197
[22] DE, EUROFER, FI, IT, SE; Compiled comments (March 2020) with EIPPCB assessment.xlsx, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showPost&forumID=129988&postID=131729

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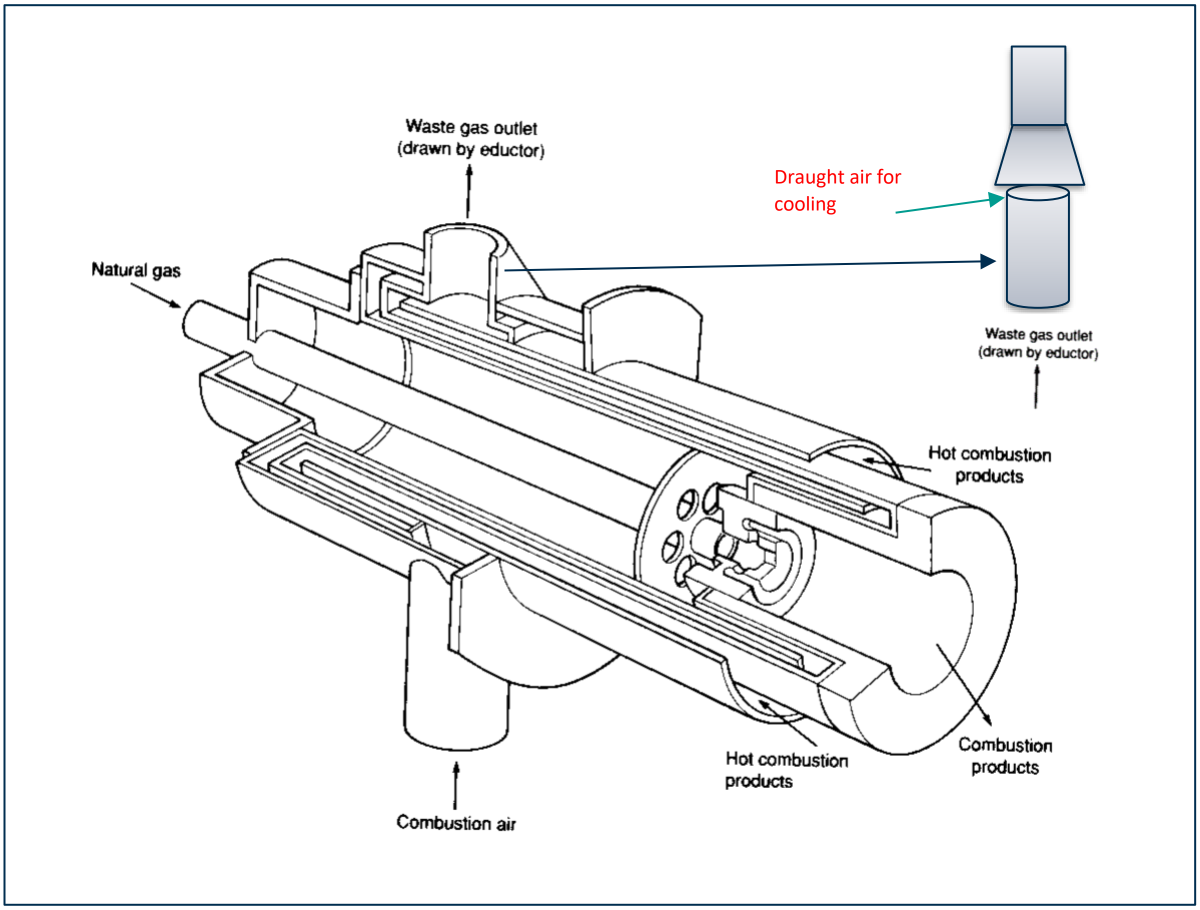
temperature range (800 – 1000 °C) which restrict the use of SNCR. SCR technique requires lower waste gas temperature but the use of this technique is also restricted due to the use of draught air to cool waste gases and prevent material wear on waste gas channels. Illustration of the use of draught air is given in Figure 3 and can also be found in reference material by manufacturer[23]. In case SCR is to be used, then additional heating is needed to increase waste gas temperature before the SCR process, resulting in negative cross media effect due to increased energy consumption.

Using tube burners for heating restricts the possibilities to use several of the proposed techniques for reduction of NO_x. As a consequence, the possibility to reduce NO_x emissions is limited and the only option may be to not to use air preheating, or reduce it (if possible)[24]. All measures taken to reduce air preheating will result in negative cross media effect due to increased energy consumption.

Figure 3. Schematic of a self-recuperative burner



[23] http://www.esapyronics.com/wp-content/uploads/2014/03/Radiant-Tube-Self-recuoerative-burner-ESA.png
[24] Limiting air preheating has to be evaluated on a case to case basis. It´s not certain that limiting air preheating is possible due to i.e. burner design, technically constraints in the flue gas channel.

Reference: FMP_revised_Draft_1.pdf, p.549. Added illustration of draught air.

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NO_x emissions

There is a strong correlation between air preheating and concentration of NO_x emissions in the waste gases. As illustrated in the first chapter, the emissions will increase in situations where the feedstock is heated to higher temperatures, resulting in high temperature of the waste gas making it possible for an increased heat transfer to the incoming combustion air.

The proposed BAT-AELs for NO_x from feedstock heating in HR, CR, WD, HDC, and BG are presented in the revised draft BAT conclusions (October 2020). The proposed values from the revised draft are also given below in Table 1 to Table 5. As has been presented in the first chapter, the concentration of NO_x in the waste gas is highly dependent on the applied heating process, i.e. low temperature when material is heated to e.g. < 600 - 700 °C, or high temperature heating when the material is heated above 900 °C. It´s not rational that the proposed BAT-AELs differ to such high extent between type of processing (HR, CR, HDC, and BG), and between specific heating processes (Reheating and Post-heating). High temperature heating of material is used in all processes in general, and specifically in Post-heating for Hot Rolling. High temperature heating is also being used to a larger extent since this treatment type is needed in production of high-strength (HSS), and ultra-high strength steels (UHSS). The proposed BAT-AELs for NO_x is set at such a low level that it will restrict the use of recuperative technique and high temperature heating in certain processes.

The following chapters will present several examples of heat treatment processes resulting in higher NO_x concentrations than the proposed BAT-AELs. These examples have been submitted by several TWG members and uploaded into BATIS.

TABLE 1. HOT ROLLING – PROPOSED BAT-AEL

Type of fuel	Specific Process	BAT-AEL
100 % natural gas	Reheating	New plants: 80-200 Existing plants: 100-350
	Intermediate heating	100-250
	Post-heating	100-200
Other fuel	All	100-350 (1)

(1) The higher end of the BAT-AEL range may be exceeded when using a high share of coke oven gas or of CO-rich gas from ferrochromium production (e.g. > 50 % of energy input). In this case, the higher end of the BAT-AEL range is 550 mg/Nm^3.

TABLE 2. COLD ROLLING – PROPOSED BAT-AEL

Type of fuel	Specific Process	BAT-AEL
100 % natural gas	n/a	100-250
Other fuel	n/a	100-300 (1)

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(1) The higher end of the BAT-AEL range may be exceeded when using a high share of coke oven gas or of CO-rich gas from ferrochromium production (e.g. > 50 % of energy input). In this case, the higher end of the BAT-AEL range is 550 mg/Nm3.

TABLE 3. WIRE DRAWING – PROPOSED BAT-AEL

Type of fuel	Specific Process	BAT-AEL
n/a	n/a	100-250

TABLE 4. HOT DIP COATING – PROPOSED BAT-AEL

Type of fuel	Specific Process	BAT-AEL
n/a	n/a	100-300 (1)

(1) The higher end of the BAT-AEL range may be exceeded when using a high share of coke oven gas or of CO-rich gas from ferrochromium production (e.g. > 50 % of energy input). In this case, the higher end of the BAT-AEL range is 550 mg/Nm^3.

TABLE 5. BATCH GALVANIZING

Type of fuel	Specific Process	BAT-AEL
n/a	n/a	70-150 (1)

(1) The BAT-AEL does not apply when the NO_X mass flow is below 500 g/h.

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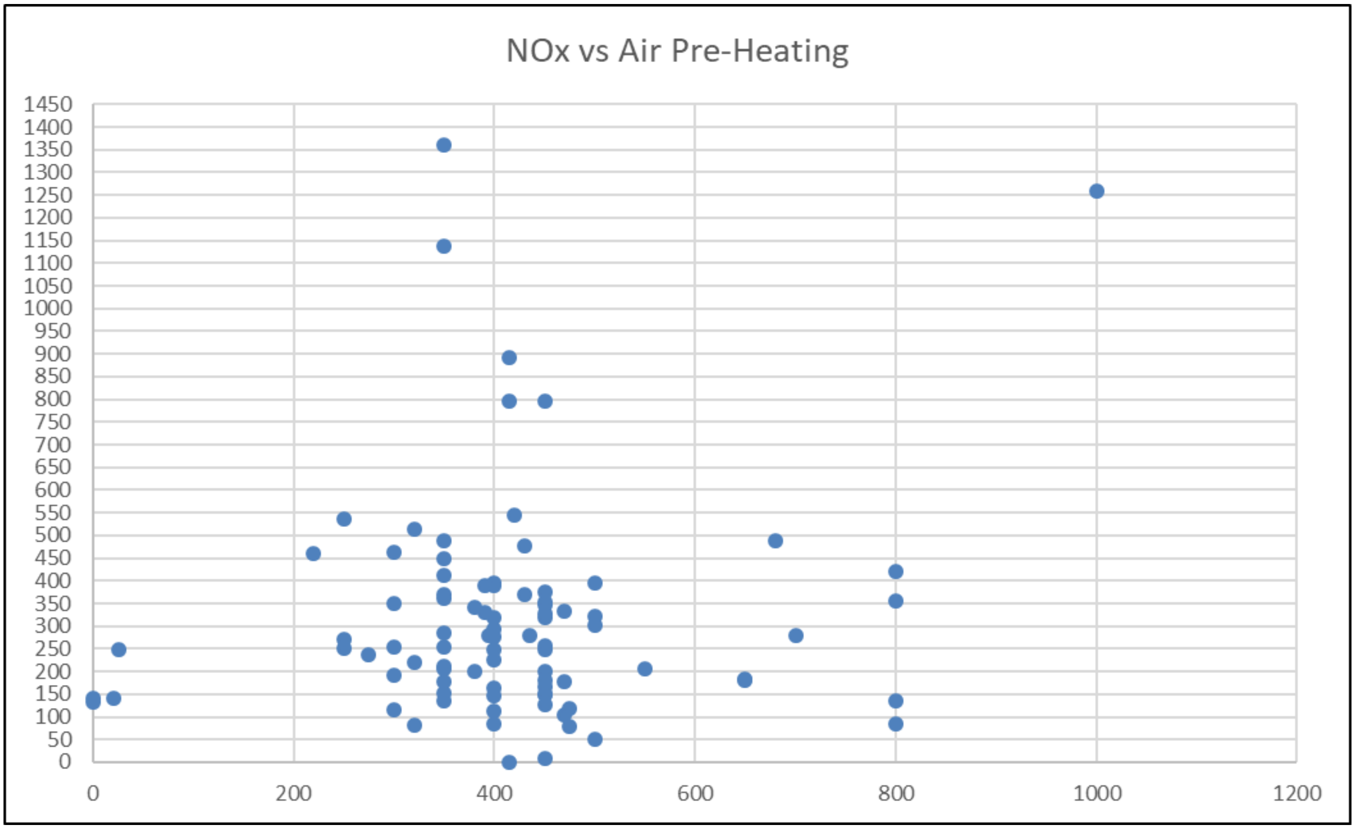
Hot Rolling (HR) – Reheating (NG)

Analysis of NO_x concentration and air preheating has previously been provided by EUROFER in document uploaded in BATIS, *"NO_x and air pre-heating correlation (2020-03-10).pdf"*[25]. In the provided analysis the increased variation in NO_x is illustrated. In Figure 4 max concentration values are plotted against air preheating temperature. Data is given by the document uploaded into BATIS, *"01a-HR air emissions data tables.xlsx"*[26]. Notable is the increased variation with higher air preheating temperature. An analysis of the "moderate" NO_x emissions in relation to high air preheating (800 °C) has been provided in *"NO_x and air pre-heating correlation (2020-03-10).pdf"*. It is not possible to reach an air preheating temperature of 800 °C except if regenerative burner is used alone.

By Figure 4 it is clear that there are many operators (furnaces) reaching concentrations of NO_x above the proposed BAT-AEL for existing plants (350 mg/Nm^3) when air preheating is applied.

Figure 4. Hot-Rolling Reheating, Maximum concentration @ 3% O2 (mg/Nm3), Type of fuel for max concentration @ 3% O2 = NG (100 %); [Labels: Y-axis, NO_x (mg/Nm3 @ 3 % O2); X-axis, Air Preheating temperature (°C)]



[25] EUROFER annexes.zip, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showPost&forumID=132013&postID=130200

[26] 01a-HR air emissions data tables.xlsx, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showPost&forumID=129987&postID=130005

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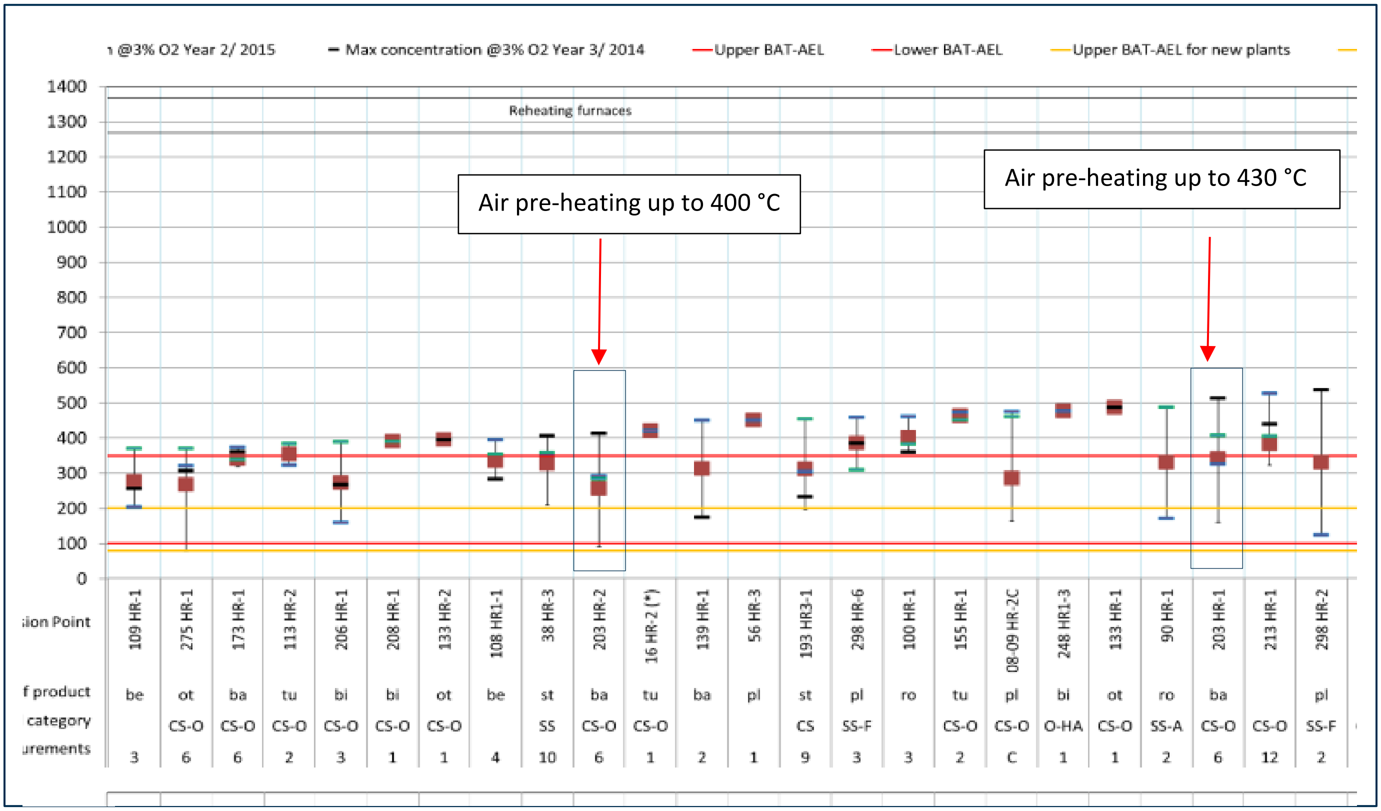
Supporting information on increased NO_x concentration in relation to air preheating with natural gas is also addressed in FMP BREF Draft 1, Figure 2.42, where data is presented for plant 203 HR-1 and 2[27]. Emission points for plant 203 are illustrated in Figure 5. There is a substantial variation in reported NO_x concentration over the 3-year period, most likely reflected by the variation in air preheating. The NO_x concentration is above the proposed BAT-AEL (350 mg/Nm^3) in several observations.

Figure 5. Data and air preheating plant 203 HR-1 and 2; [Labels: Y-axis, NOx (mg/Nm3 @ 3 % O2)]



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27 FMP_revised_Draft_1.pdf, p. 54

Hot Rolling (HR) – Re-heating (Other Fuels)

As for the situation above when using 100 % natural gas, the same analysis has been made when using other fuels. In Figure 6, max concentration values are plotted against air preheating temperature. Data is given by the document uploaded into BATIS, *"01a-HR air emissions data tables.xlsx"*[28]. Again, there is an increased variation with higher air preheating temperature. Note that situations with lower NO_x concentration (< 300 mg/Nm^3) and high air preheating is a result of using BFG and BOFG in combination with natural gas. This results in lower NO_x-concentration due to the inert components in BFG and BOFG (i.e. N_2 and CO_2).

From Figure 6, it is clear that there are many operators (furnaces) reaching concentrations of NO_x above the proposed BAT-AEL (350 mg/Nm^3) when air preheating is applied. When analysing the data using 100 % COG in Figure 7, 6 out of 7 observations are higher than the proposed BAT-AEL using a high share of COG (> 50 %). It is clear that the higher proposed emission level 550 mg/Nm^3 does not account for situations of air preheating when using 100% COG. This fact is also supported by the information given in the FMP BREF revised D1, Figure 8.43 p. 630.

Figure 6. Hot-Rolling Reheating, Maximum concentration @ 3% O2 (mg/Nm3), Type of fuel for max concentration @ 3% O2 = (100 %) BOF, COG, LPG, Oil, and Mixed Fuel; [Labels: Y-axis, NO_x (mg/Nm3 @ 3 % O2); X-axis, Air Preheating temperature (°C)]

[28] 01a-HR air emissions data tables.xlsx, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showPost&forumID=129987&postID=130005

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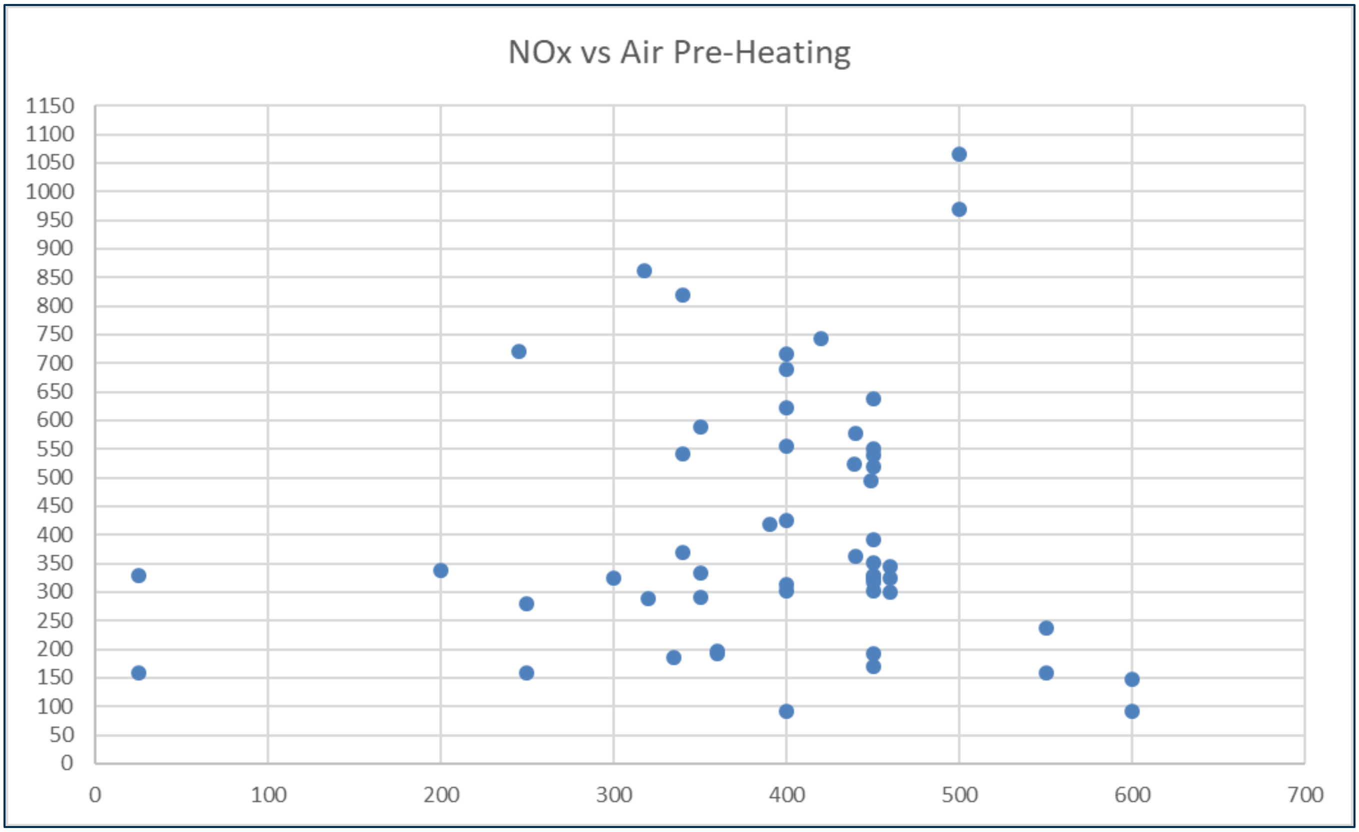
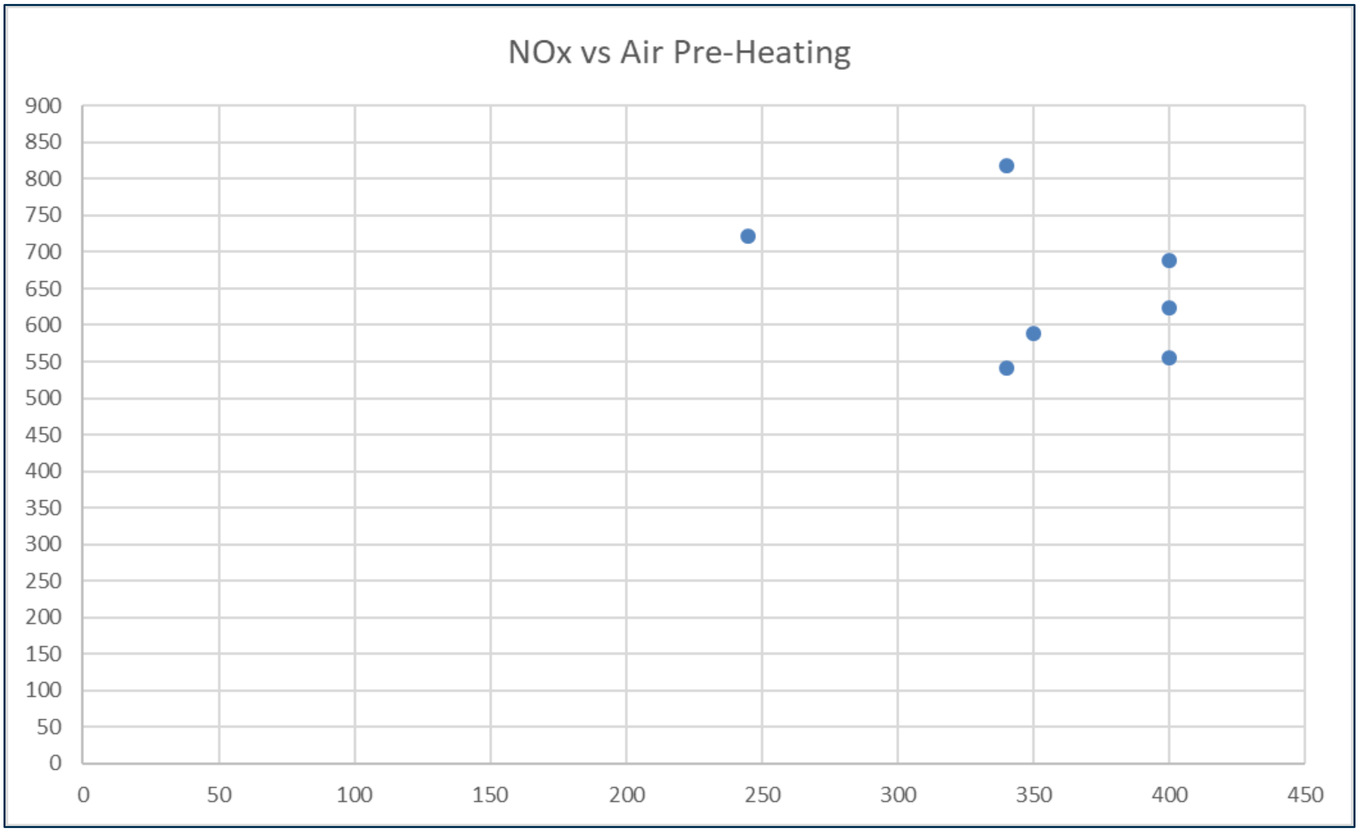


Figure 7. Hot-Rolling Reheating, Maximum concentration @ 3% O2 (mg/Nm3), Type of fuel for max concentration @ 3% O2 = (100 %) COG; [Labels: Y-axis, NO_x (mg/Nm3 @ 3 % O2); X-axis, Air Preheating temperature (°C)]



Supporting information on the correlation between NO_x concentration and high air preheating temperature (reheating) can also be found in the document *"ANNEX 2 - 20180620_FMP_Bref_walking_beam_furnaces_NOx_relations_Sob_E01.pdf"* uploaded in BATIS[29]. The document contains information on the influence of air preheating as well as calorific value for reheating furnaces using NG and BOFG as fuel. Supporting information on the relationship air preheating vs. NO_x is presented in Figure 8 and Figure 9. The same figures are included in the supporting document. From an analysis of the figures, a majority of the observations is in the range of 300 – 600 mg/Nm^3 when air preheating is > 400 °C.

[29] ANNEX 2 - 20180620_FMP_Bref_walking_beam_furnaces_NOx_relations_Sob_E01.pdf, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showForum&forumID=128415

Figure 8. ArcelorMittal Bremen, Relation NO_x and Air preheating (Furnace 1); Timespan: 07.09.2017 – 06.06.2018

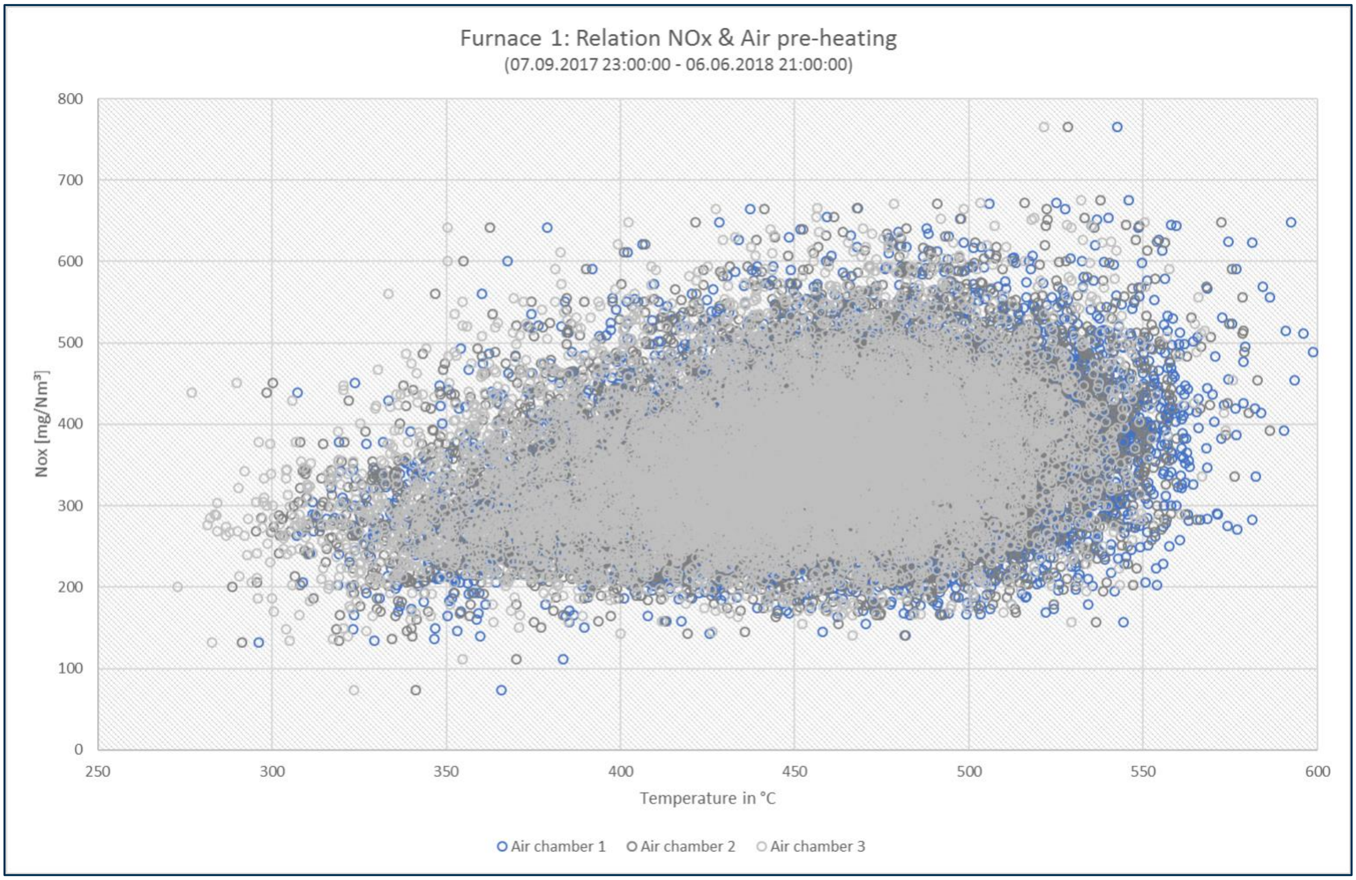
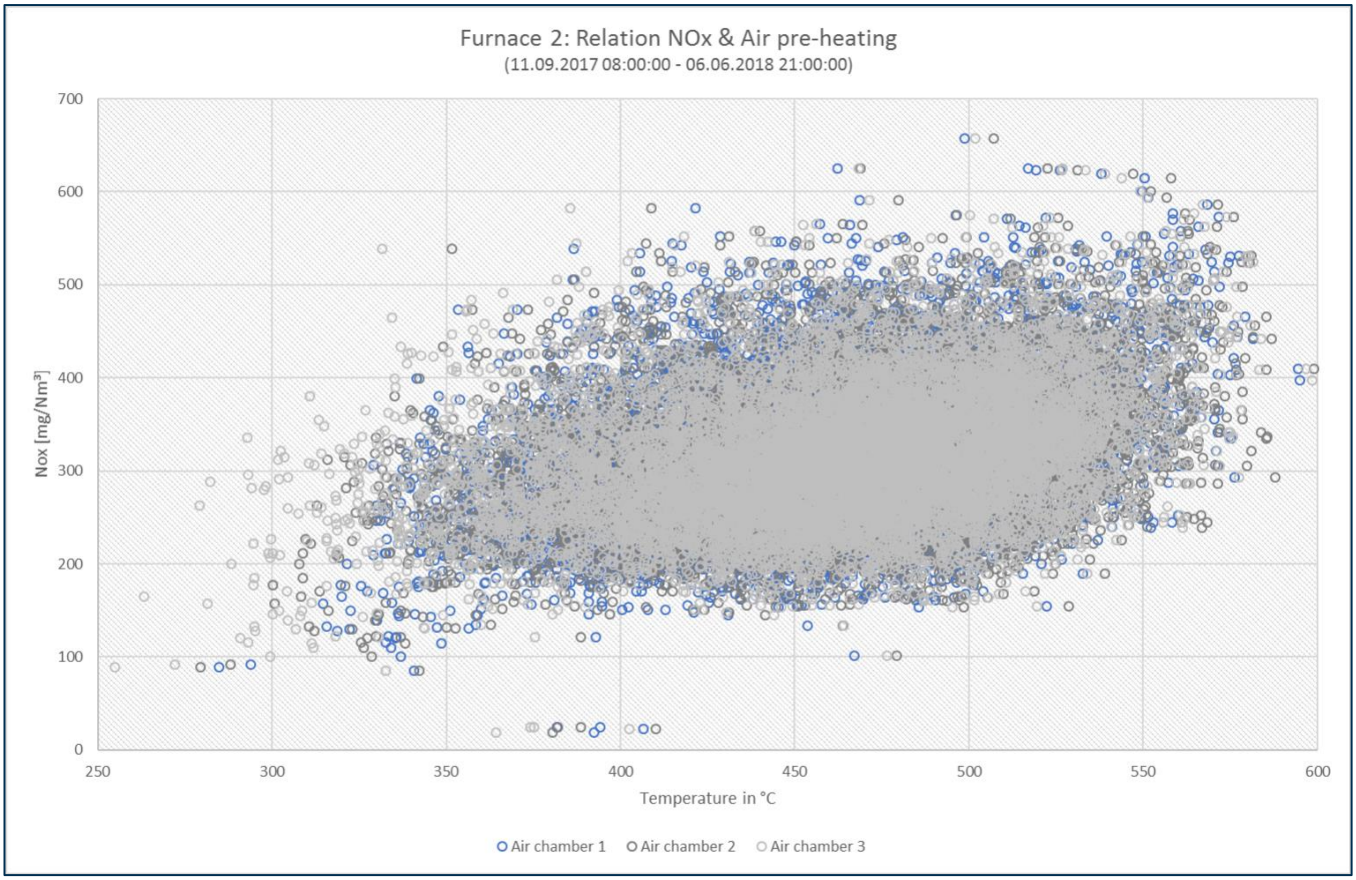


Figure 9. ArcelorMittal Bremen, Relation NO_x and Air preheating (Furnace 2); Timespan: 07.09.2017 – 06.06.2018



Hot Rolling (HR) – Post heating and Intermediate heating (NG)

For Post-heating using 100 % natural gas, data is plotted in Figure 10. Inconclusive data from plant 217 HR is excluded. This plant has not reported the use of air preheating technique and it is unclear how such high air preheating temperature can be obtained.

Excluding data from plant 217, there is an increase in NO_x concentration with increased air preheating temperature. As air preheating temperature reaches 400 °C, only 3 out of 9 observations are clearly below the proposed BAT-AEL (200 mg/Nm³).

Figure 10. Hot-Rolling Post-heating, Maximum concentration @ 3% O2 (mg/Nm3), Type of fuel for max concentration @ 3% O2 = (100 %) NG; [Labels: Y-axis, NO_x (mg/Nm3 @ 3 % O2); X-axis, Air Preheating temperature (°C)]

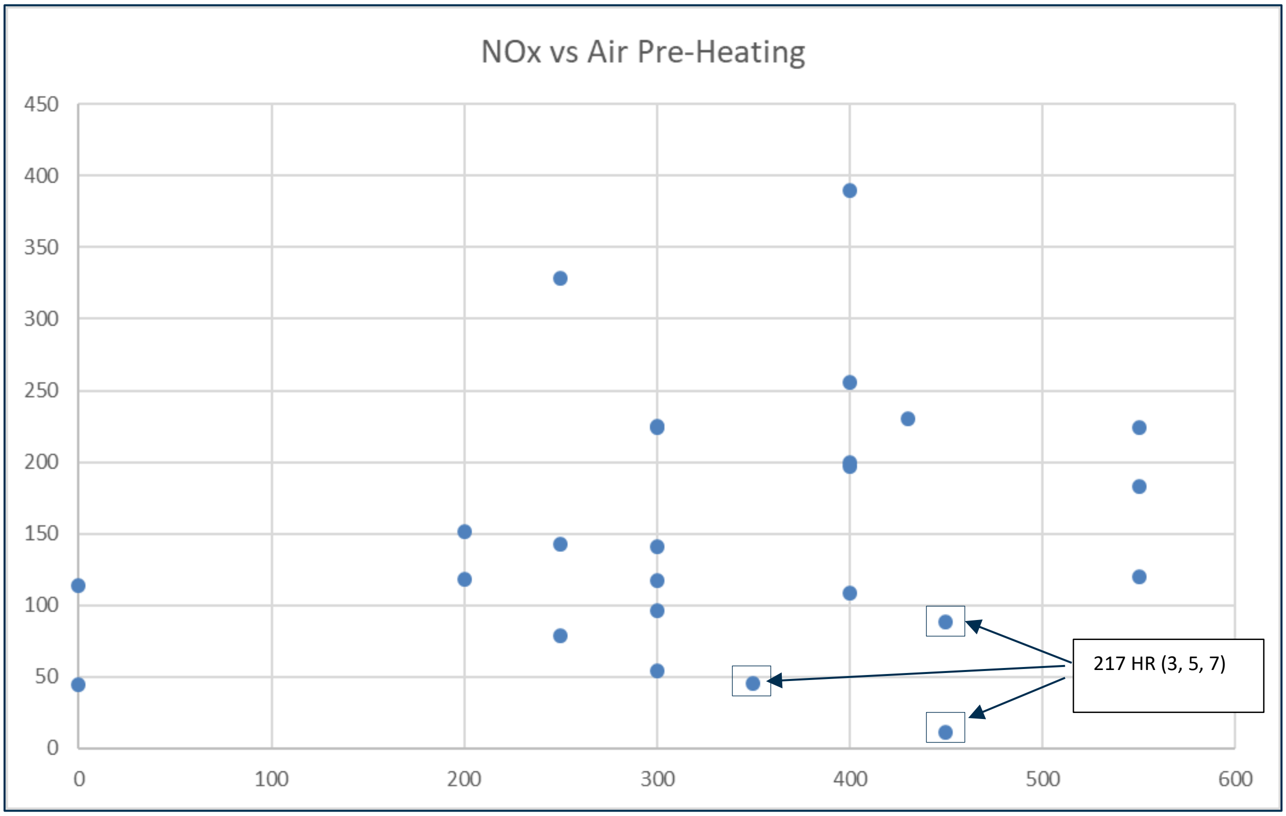
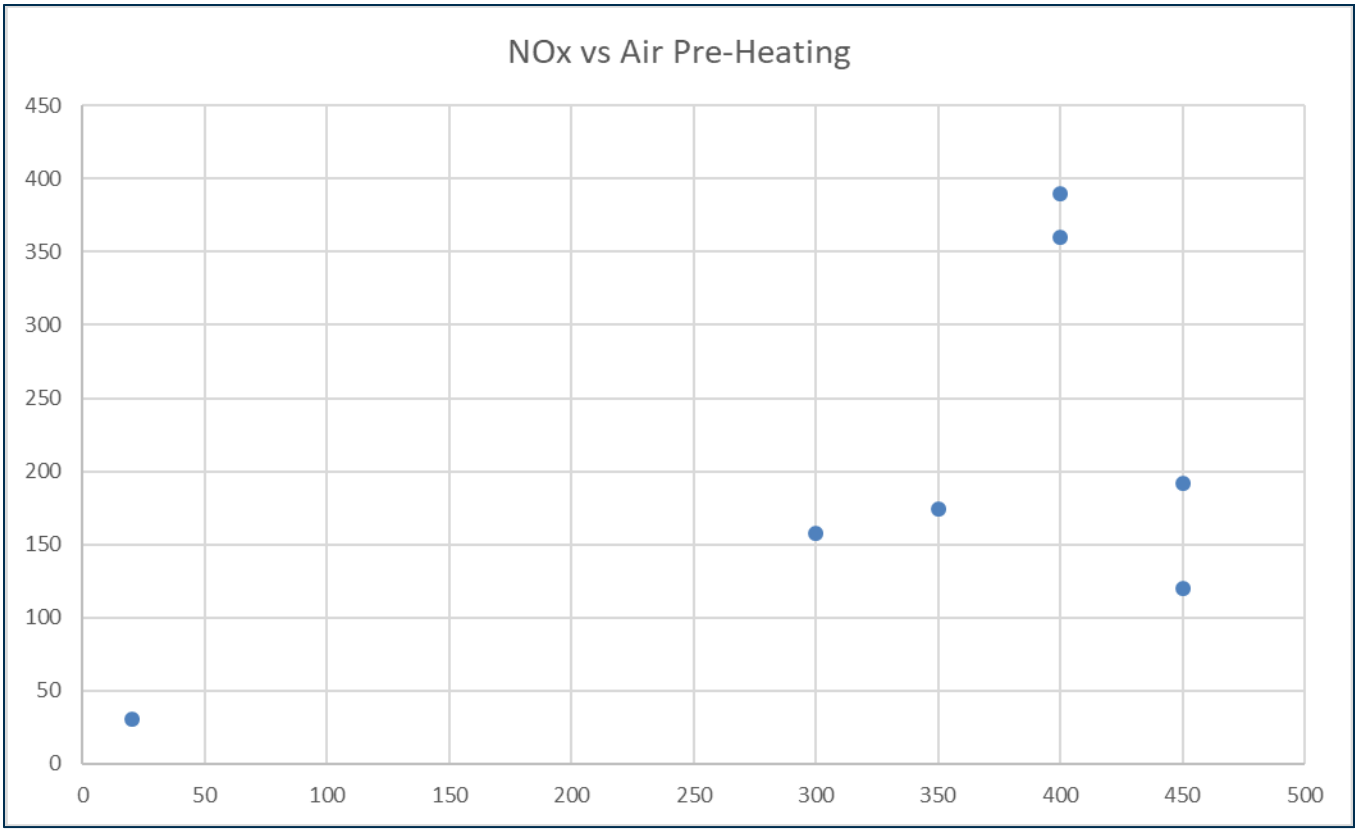


Figure 11. Hot-Rolling Intermediate heating, Maximum concentration @ 3% O2 (mg/Nm3), Type of fuel for max concentration @ 3% O2 = (100 %) NG; [Labels: Y-axis, NO_x (mg/Nm3 @ 3 % O2); X-axis, Air Preheating temperature (°C)]



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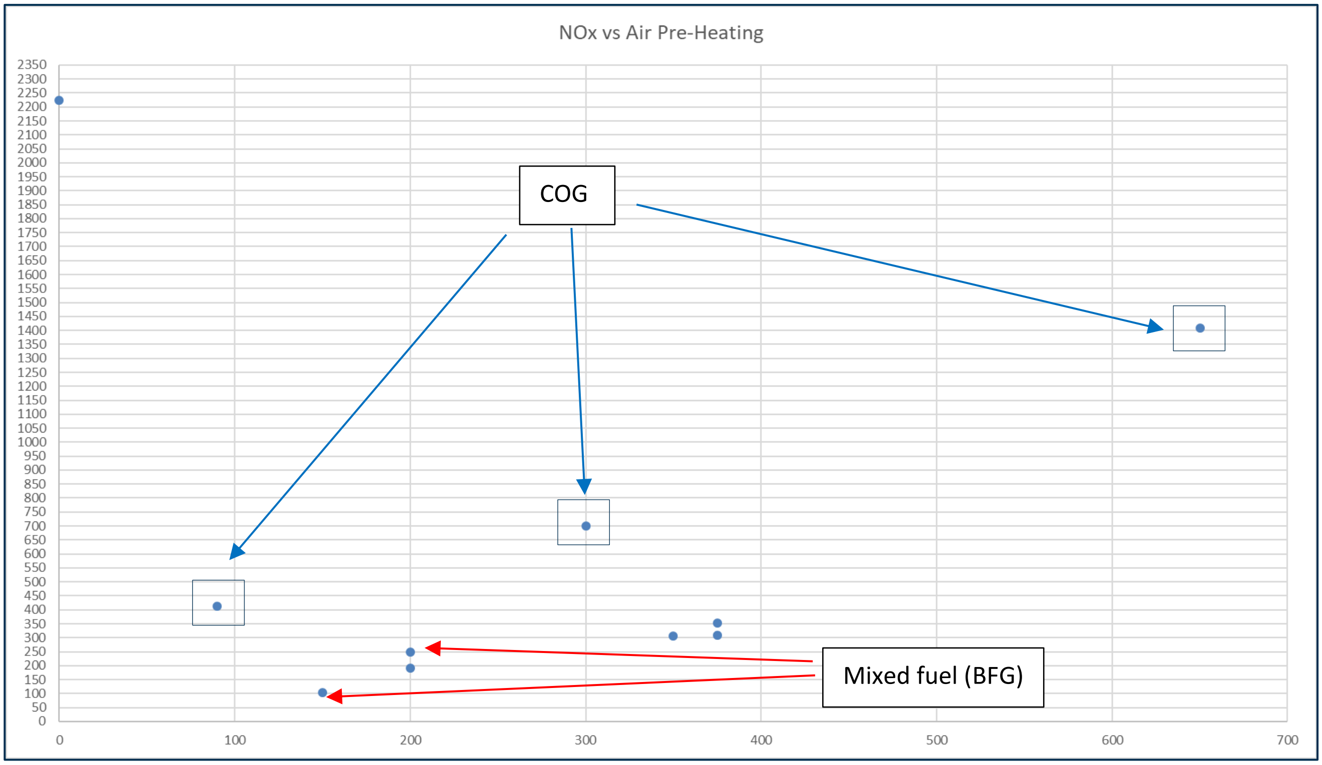
Hot Rolling (HR) – Post heating and Intermediate heating (Other Fuels)

Analysis has been provided by EUROFER in the submitted document "*NOx and air-pre heating correlation (2020-03-10)*"[30]. When taken account for high air preheating temperatures emission levels are exceeding the proposed BAT-AEL for using high share of COG (COG > 50 %, 550 mg/Nm3 @ 3 % O2). This account for i.e. plant 243 HR-3 (approx. 700 mg/Nm^3) and 4 (approx. 1400 mg/Nm^3).

BFG is used in mixed fuel for two of the observations below 250 mg/Nm^3. BFG is a fuel resulting in low NO_x-concentration due to inert components in the fuel (N_2 and CO_2).

Figure 12. Hot-Rolling Post-Heating, Maximum concentration @ 3% O2 (mg/Nm3), Type of fuel for max concentration @ 3% O2 = (100 %) COG, LPG, Mixed fuel; [Labels: Y-axis, NO_x (mg/Nm3 @ 3 % O2); X-axis, Air Preheating temperature (°C)]



[30] EUROFER annexes.zip, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showPost&forumID=132013&postID=130200

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Cold Rolling (CR)

In batch annealing, the higher end of the NO_x values are associated to higher annealing temperatures (700-750°C) which are 50-100°C higher than most of the other plants.

In figure 32. CR-figure 3.32 (figure 3.45 of the FMP BREF revised D1), we can see a clear tendency for higher NO_x values when the operating temperature is higher than 700 up to 750°C (temperatures are part of the questionnaire).

Supporting data has been provided to show the correlation between NO_x concentration and air temperature for batch annealing: see documents 'Additional comments to NO_x and preheating in batch annealing.pdf' and 'CR Figures 3.32.pdf' already uploaded into BATIS.

These higher annealing temperatures are reported for 209 CR-2;115 CR-1; 45CR-1; 45CR-2; 209CR-3.

As mentioned in EUROFER #60 and EUROFER #61 to the BATC (October 2020), it is very difficult to implement techniques like SCR or SNCR to reduce NO_x emissions in batch annealing. There are no batch annealing lines with SCR known in Europe, and SNCR isn't possible because the temperature range for this technique isn't achieved. The applicability constraints to the use of both techniques is also further developed in the previous section above, "*BAT 20 – Available Techniques and Applicability constraints in relation to air preheating*".

The option to limit air preheating means that the unused energy content in the flue gas is wasted and must be compensated 1-to-1 with higher fuel consumption. A surplus of energy of 15% is considered a realistic number. Moreover, the burners may have a limited firing rate when using ambient air: in these cases, longer annealing times will result in a reduced yield (reduced production rate). For the burners for which the firing rate can be increased, this will result in higher NO_x mass emissions.

For one plant, an illustrative example of the surplus energy needed when limiting air preheating temperatures is given below.

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Calculation of the CO2 surplus when reducing air preheating - batch anneal example

Faktor: 1m³ NG = 1m³ NG= 31736 kJ
NG m³ x 1,98 = CO2

			with air preheating		without air preheating	**limiting air preheating**
	GJ/Y	NG m³/Y	to/Y		plus 25% NG	plus 15% NG
			to CO2 / Y		Plus to CO2 / Y	Plus to CO2 / Y
Example plant	300.000	9.452.987	**18.717**		4.679	**2.808**

Fluegas generation (cautious estimate)

Air / NG gas relation at 5,5% O2 = 13,5
Fluegas generation NG m³ x 13,5 + NG m³ = Fluegas m³

			with air preheating		without air preheating	limiting air preheating
	Energy / Y	Energy / Y	CO2	Rauchgas m³	Rauchgas m³	Rauchgas m³
	GJ/Y	NG m³/Y	to/Y	ges/Y	ges/Y	ges/Y
			to CO2 / Y		plus 25% NG	plus 15% NG
Example plant	300.000	9.452.987	18.717	137.068.314	171.335.392	157.628.561

Other TWG members have also pointed to the current lack of consideration of the positive impacts of air preheating on energy consumption and CO2 emissions in the current BAT-AEL range[31].

Finally, the Energy Efficiency (ENE) BREF states that:

- It may not be possible to both maximise the total energy efficiency and minimise other consumptions and emissions (e.g. it may not be possible to reduce emissions such as those to air without using energy).

[31] See, for example, DE_Comments to Revised Draft BATc_Oct 2020.xlsx, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showPost&forumID=131724&postID=131995 and DE_Sample calculation for NOx reduction by limiting air preheating in batch annealing furnaces.xlsx, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showPost&forumID=131724&postID=131997

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Hot Dip Coating (HDC)

Information provided by one TWG member in October 2020, document *"Annex FI1, October 2020"* supports NO_x concentration above the proposed BAT-AEL for HDC in case of air preheating in the range of 400 °C[32]. In this case the air preheating concentration ranges between 360 – 400 °C and NOx concentration between approx. 300 – 550 mg/Nm^3.

[32] Annex FI1, October 2020.pdf, https://eippcb.jrc.ec.europa.eu/batis/console/forumIndex.jsp?fuseAction=forum_showPost&forumID=131724&postID=131973

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Annex IV: FMP Split view assessment report – Final.pdf

EUROPEAN COMMISSION
JOINT RESEARCH CENTRE
Directorate B – Growth and Innovation
Circular Economy and Industrial Leadership Unit
European IPPC Bureau

Seville, 23 June 2021

REVIEW OF THE BEST AVAILABLE TECHNIQUES (BAT) REFERENCE DOCUMENT ON THE FERROUS METALS PROCESSING INDUSTRY (FMP BREF)

Assessment of split view rationales

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1 INTRODUCTION

1.1 General aspects

According to Commission Implementing Decision 2012/119/EU (Section 4.6.2.3, page 27), the following provisions apply to dissenting views expressed at Final TWG Meetings:

4.6.2.3 Final TWG meeting

4.6.2.3.1 General

The final TWG meeting aims at resolving outstanding issues with a view to conclude the technical discussions within the TWG.

In the final TWG meeting, the objective is to reach conclusions by consensus of the TWG members present. When there are well founded dissenting views, these will be recorded as indicated in Section 4.6.2.3.2 below.

4.6.2.3.2 Split views

BAT as well as environmental performance levels (see Section 3.3) associated with BAT will be drafted by the EIPPCB on the basis of information available at the time of distributing the draft to the TWG for its final meeting (see Section 4.6.2.3). Such information may include any specific proposals for BAT or associated environmental performance levels received from the TWG.

TWG members are expected to provide sound technical, cross-media and economic arguments as relevant to their case when they do not agree with the draft BAT conclusions. Such arguments should be submitted initially as comments to the formal draft BREF within the consultation period set (see Section 1.2.4).

If the TWG in the end reaches no consensus on an issue, the dissenting views and their rationale will be reported in the "Concluding remarks and recommendations for future work" section of the BREF only if both the following conditions are fulfilled:

1. the dissenting view is based on information already made available to the EIPPCB at the time of drafting the conclusions on BAT for the BREF or has been provided within the commenting period corresponding to such a draft;

2. a valid rationale supporting the split view is provided by the TWG member(s) concerned. The EIPPCB will consider a rationale to be valid if it is supported by appropriate technical, cross-media or economic data or information relevant to the definition of BAT.

The Member States, environmental NGOs or industry associations that bring or support the split view will be explicitly named in the document (see Section 2.3.10).

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This document lists the split views submitted in the context of the Final TWG Meeting for the review of the FMP BREF (which was carried out between 23 November 2020 and 8 February 2021 via a series of 9 web-based meetings), and assesses for each split view whether both of the conditions 1 and 2 listed above are met. The chapter on "Concluding remarks and recommendations for future work" of the revised FMP BREF shall reflect the dissenting views for which the present assessment shows that such conditions are met.

However, a positive assessment of those conditions and the reporting of a dissenting view in the BREF are not to be interpreted as an agreement of the EIPPCB with the arguments supporting that split view, or as an indication that the related BAT conclusion as agreed at the Final TWG Meeting may be subject to changes.

For the purposes of this document, the following acronyms are used.

Acronym	Definition
AT	Austria
BAT	Best Available Techniques (as defined in Article 3(10) of the IED)
BAT-AEL	Emission level associated with the BAT (as defined in Article 3(13) of the IED)
BAT-AEPL	Environmental performance level associated with the BAT: BAT-AELs are a subset of BAT-AEPLs (see also Commission Implementing Decision 2012/119/EU laying down rules concerning guidance on the collection of data and on the drawing up of BREFs and on their quality assurance)
BATC	BAT conclusions
BG	Batch galvanising
BOF	Basic oxygen furnace gas
BP	Background paper for the Final Meeting of the Technical Working Group (TWG) for the review of the FMP BREF, released on 5 February 2020
BREF	BAT reference document (as defined in Article 3(11) of the IED)
COG	Coke oven gas
CR	Cold rolling
CZ	Czech Republic
D1	First draft of the revised FMP BREF, published on 29 March 2019
DE	Germany
EEB	European Environmental Bureau
EGGA	European General Galvanizers Association
EIPPCB	European IPPC Bureau
ELV	Emission Limit Value
EN	European Standard adopted by CEN (European Committee for Standardisation, from its French name Comité Européen de Normalisation)
EP	Emission point
ES	Spain
EUROFER	The European Steel Association
FMP	Ferrous Metal Processing
HDC	Hot dip coating
HR	Hot rolling
IED	Industrial Emissions Directive (2010/75/EU)
IS BREF	BAT Reference Document for Iron and Steel Production
IT	Italy
KEI	Key environmental issue of the FMP BREF review
KoM	Kick-off Meeting
LCP BREF	BAT Reference Document for Large Combustion Plants
LoQ	Limit of quantification
LPG	Liquefied petroleum gas
MS	Member State(s)
NG	Natural gas
OTNOC	Other than normal operating conditions
PT	Portugal
SCR	Selective catalytic reduction

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SNCR	Selective non-catalytic reduction
SE	Sweden
SK	Slovakia
TWG	Technical Working Group
UK	United Kingdom
WD	Wire drawing
WI BREF	BAT Reference Document for Waste Incineration

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1.2 Overview of split views expressed at the Final TWG Meeting for the review of the FMP BREF and confirmed afterwards

During the Final TWG Meeting for the review of the FMP BREF held between 23 November 2020 and 8 February 2021, a high degree of consensus was achieved within the TWG. Nevertheless, 15 dissenting views were recorded at the meeting and confirmed afterwards. These are listed in the following table.

Split view number	Consolidated FMP Final Meeting conclusions' slide number(s)	Topic	BAT conclusion / Table number	TWG member(s) raising the split view(s) and those supporting it	Section number in this document
1	106, 107	Higher end of BAT-AEPL range for feedstock post-heating	BAT 10 / Table 9.22	EUROFER supported by CZ	2.1.1
2	153, 154	Mass flow threshold for channelled dust emissions to air from feedstock heating	BAT 18 / Table 9.4	DE, AT, SE, supported by EEB	2.2.1
3	157, 158	Higher end of BAT-AEL range for channelled SO_2 emissions to air from feedstock heating (footnote ([3]))	BAT 19 / Table 9.5	EEB	2.2.2
4	169, 171	Higher end of BAT-AEL range for channelled NO_X emissions to air from feedstock reheating (existing plants), intermediate heating and post-heating when using 100% NG and high air preheating	BAT 20 / Table 9.6	EUROFER supported by CZ and PT	2.2.3
5	170, 171	Higher end of BAT-AEL range for channelled NO_X emissions to air from feedstock reheating, intermediate heating and post-heating when using fuels other than 100% NG and high air preheating	BAT 20 / Table 9.6	EUROFER supported by CZ and SK	2.2.4
6	170, 171	Higher end of BAT-AEL range for channelled NO_X emissions to air from feedstock reheating, intermediate heating and post-heating when using fuels other than 100% NG	BAT 20 / Table 9.6	EEB	2.2.5
7	169, 170, 171	Higher end of BAT-AEL range for channelled NO_X emissions to air from feedstock reheating, intermediate heating and post-heating when processing high-alloy steels	BAT 20 / Table 9.6	EUROFER	2.2.6
8	169, 172	Higher end of BAT-AEL range for channelled NO_X emissions to air from high-temperature heat treatment in feedstock post-heating when using 100% NG	BAT 20 / Table 9.6	EUROFER	2.2.7

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Split view number	Consolidated FMP Final Meeting conclusions' slide number(s)	Topic	BAT conclusion / Table number	TWG member(s) raising the split view(s) and those supporting it	Section number in this document
9	174, 175	Higher end of BAT-AEL range for channelled NO_X emissions to air from feedstock heating in cold rolling when using 100% NG and high air preheating	BAT 20 / Table 9.7	EUROFER supported by SK	2.2.8
10	174, 175	Higher end of BAT-AEL range for channelled NO_X emissions to air from feedstock heating in cold rolling when using fuels other than 100% NG and high air preheating	BAT 20 / Table 9.7	EUROFER supported by SK	2.2.9
11	180, 181	Higher end of BAT-AEL range for channelled NO_X emissions to air from feedstock heating in hot dip coating when using 100% NG or fuels other than 100% NG and high air preheating	BAT 20 / Table 9.9	EUROFER supported by SK	2.2.10
12	183, 184	BAT-AEL range and mass flow threshold for channelled NO_X emissions to air from heating the galvanising kettle in BG	BAT 20 / Table 9.10	PT	2.2.11
13	247, 250, 252, 253	Techniques to reduce the quantity of waste sent for disposal (BAT statement and Technique (f))	BAT 31	EEB	2.3.1
14	318, 322	Techniques to reduce emissions to air of HCl from pickling and stripping in batch galvanising (BAT statement)	BAT 22bis	EGGA, ES supported by IT and PT	3.1.1
15	324, 325	Higher end of BAT-AEL range for channelled HCl emissions to air from pickling and stripping with hydrochloric acid in batch galvanising	BAT 22bis / Table 9.33	EGGA	3.1.2

For each of the split views, the detailed rationales provided after the meeting by the TWG member(s) concerned are summarised in the following pages together with the EIPPCB's assessment and an indication of whether/how the split views could be formulated in the BREF. The contents of individual split views on the same topic may differ from one to another. In this document, some split views are grouped together when the proposals and the rationales are similar.

1.3 Split views expressed after the Final TWG Meeting for the review of the FMP BREF

An additional split view (see table below) was submitted by a TWG member after the Final TWG Meeting without having been raised during the meeting. This position is not presented or assessed in this document given that the last paragraph of Section 4.6.2.3.1 of Commission Implementing Decision 2012/119/EU (under "*4.6.2.3 Final TWG meeting*") stipulates the following:

***"In the final TWG meeting**, the objective is to reach conclusions by consensus of the TWG members present. When there are well founded dissenting views, these will be recorded as indicated in Section 4.6.2.3.2 below."*

Additional split view number	Consolidated FMP Final Meeting conclusions' slide number(s)	Topic	BAT conclusion / Table number	TWG member(s) raising the split view(s)
1	3	2.6. Surface treatment of ferrous metals using electrolytic or chemical processes where the volume of the treatment vats exceeds 30 m^3 when it is carried out in cold rolling, wire drawing or batch galvanising	Scope	EGGA

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1.4 Split views expressed during the Final TWG Meeting for the review of the FMP BREF but not confirmed after the meeting

The following dissenting view was expressed during the Final TWG Meeting but was not confirmed by sending documentation to the EIPPCB after the meeting. This split view is considered as not having been submitted and is not presented or assessed in this document.

Unconfirmed split view number	Consolidated FMP Final Meeting conclusions' slide number(s)	Topic	BAT conclusion / Table number	TWG member(s) raising the split view(s) and those supporting it
1	156	Addition in the BAT statement of a reference to "either electricity produced from renewable sources or"	BAT 19	FR

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2 GENERAL BAT CONCLUSIONS

2.1 Energy efficiency

2.1.1 Higher end of BAT-AEPL range for feedstock post-heating (EUROFER, supported by CZ)

Conclusion of the meeting

Slides 106 and 107 – BAT 10 / Table 9.22:

Table 9.22: BAT-associated environmental performance levels (BAT-AEPLs) for specific energy consumption ~~in~~ for feedstock heating in hot rolling

Specific process(es) ~~— Type of products~~ *Steel products at the end of the rolling process*	Unit	BAT-AEPL (Yearly average)
Feedstock reheating ~~— Flat products~~		
Hot rolled coils (strips)	MJ/t	~~500~~ 1 200–1 ~~8~~500 ([1])
Heavy ~~P~~plates	MJ/t	1 400–2 000 ([2])
~~Feedstock reheating — Long products~~		
Bars, ~~and~~ rods	MJ/t	600–1 900 ([2])
Beams, billets, rails, ~~and~~ tubes	MJ/t	1 400–2 200
Feedstock intermediate heating – ~~Long products~~		
Bars, rods, tubes	MJ/t	100–900
Feedstock post-heating – ~~Flat products~~		
Heavy ~~P~~plates	MJ/t	1 000–2 000
~~Feedstock post-heating — Long products~~		
Bars, ~~and~~ rods	MJ/t	1 400–3 000 ([3])

([1]) In the case of high-alloy steel (e.g. austenitic stainless steel), the higher end of the BAT-AEPL range may be higher and up to~~is~~ 2 ~~5~~200 MJ/t.
([2]) In the case of high-alloy steel (e.g. austenitic stainless steel), the higher end of the BAT-AEPL range may be higher and up to~~is~~ 2 800 MJ/t.
([3]) In the case of high-alloy steel (e.g. austenitic stainless steel), the higher end of the BAT-AEPL range may be higher and up to~~is~~ 4 000 MJ/t.

Split view summary

EUROFER (supported by CZ) proposes to include a new footnote in Table 9.22 for post-heating processes for heavy plates and bars and rods, stating that: "The higher end of the BAT-AEPL range may be higher when the feedstock is heated more than one time in the same or different furnaces (e.g. normalising followed by tempering)."

The split view is accompanied by the following rationale

- The derivation process for BAT-AEPL ranges for post-heating processes for heavy plates and bars and rods was carried out without accounting for the specificities of the post-heating process. In particular, cases exist where the feedstock can be subjected to a post-heating treatment more than once to achieve specific product characteristics. This includes production steps where the plate is subjected to normalising and air cooling, followed by additional post-heating and quenching and tempering. Depending on the number of passes and/or heat treatment concerned, the calculated specific energy consumption may be higher than the BAT-AEPLs set.
- The variety of steel grades produced and treatments is specific to the post-heating stage. In some plants, a limited tonnage of thousands of special steels can be produced every year, with hundreds of product specifications. Moreover, the FMP BREF revised D1 (p. 29) describes the different post-heating processes, in particular for finished plates that are partly subjected to heat treatment: "In annealing, steel is heated to a subcritical temperature to relieve stresses. For normalising, steel is heated above its critical temperature and air-cooled. The purpose is to refine grain sizes and to obtain a carbide distribution, which will dissolve more readily, austenite. Quenching, tempering and other methods may also be applied".

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- Post-heating furnaces may be operated in non-continuous and non-homogenous ways due to quality requirements of special steels. See FMP BREF revised D1, p. 14: "A part of the production is subjected to a subsequent heat treatment prior to shipment. Such treatments include annealing, spheroidise annealing, stress relieving, normalising, quenching and tempering." This fact was not accurately reflected in the data collection given that only one input was possible for each post-treatment furnace, although the same furnace can be (and is) used for various heat treatments.
- The operation requirements of these post-heating furnaces (heating and cooling cycles, temperatures, residence times) are defined by the specificities and quality conditions of the customers depending on the product mix (steel grades and product dimensions) and not by the efficiency rates that ferrous metal processing facilities would like to apply.

Information on which the split view is based

- Comment EUROFER 31 (uploaded in BATIS on 6/11/2020) on the revised FMP draft BAT conclusions (published in BATIS on 9/10/2020);
- EUROFER note on energy consumption data (uploaded in BATIS on 6/11/2020);
- EUROFER submission providing a list of steel products to include in the FMP BREF (uploaded in BATIS on 20/3/2020);
- EUROFER submission related to the key topics listed for the FMP 2nd Data Workshop (uploaded in BATIS on 26/11/2019).

EIPPCB assessment

The documents and information on which the split view is based were available on time.

Validity of supporting rationale:

- The information reported in the questionnaires for the plants that participated in the data collection and the information included in the additional documents submitted by EUROFER show that different types of post-heating treatments are carried out in FMP furnaces (e.g. normalising, annealing, quenching, tempering), using different types of furnaces (batch / continuous). A significant variability in the number of operating hours (e.g. 2 000 to 8 760 hours) and operating temperatures (e.g. 700 °C to 1 300 °C) is generally observed in post-heating lines.
- From the information gathered in the questionnaires, it was not possible to determine whether the feedstock was heated successively more than once in the same furnace (or even in different furnaces) because this information was not specified in the questionnaire. Therefore, for the plants in the data collection, it was not possible to ascertain whether higher specific energy consumption for some plants could be related to successive passes of the feedstock in the furnaces and/or to high post-heating operating temperatures. However, information was provided by EUROFER (i.e. note on energy consumption) showing that, in post-heating, more than one heat treatment step including an intermediate cooling step is sometimes necessary for producing certain types of steel.
- For example, higher temperatures are required in post-heating to reach product specifications, particularly for certain steel grades (e.g. electrical steel). There is one example plant in the data collection that reported producing about 50% electrical steel and exhibited a specific energy consumption above the higher end of the BAT-AEPL range.

EIPPCB conclusion

Taking these aspects into account, the EIPPCB considers that the split view representing the opinion of EUROFER supported by CZ fulfils the conditions set out in Section 4.6.2.3.2 of Commission Implementing Decision 2012/119/EU. This split view will therefore be reported in the "Concluding remarks and recommendations for future work" chapter of the BREF.

A possible formulation of this split view could be:

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BAT conclusion	Dissenting view	Expressed by	Alternative proposed level (if any)
BAT 10 / Table 9.22	*Include an additional footnote associated with feedstock post-heating (heavy plates, bars and rods) specifying that: "The higher end of the BAT-AEPL range may be higher when the feedstock is heated more than once in the same or different furnaces (e.g. normalising followed by tempering."*	*EUROFER, supported by CZ*	*NA*

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2.2 Emissions to air

2.2.1 Mass flow threshold for channelled dust emissions to air from feedstock heating (AT, DE, SE supported by EEB)

Conclusion of the meeting

Slide 153 – BAT 18 / Table 9.4:

Table 9.4: BAT-associated emission levels (BAT-AELs) for channelled dust emissions to air from feedstock heating

Parameter	Sector	Unit	BAT-AEL (1) (Daily average or average over the sampling period)
Dust	Hot rolling	mg/Nm³	< 2–10
	Cold rolling		< 2–~~5~~10
	Wire drawing		< 2–10
	Hot dip coating		< 2–10

(1) The BAT-AEL does not apply when the dust mass flow is below 100 g/h.

Split view summary

AT, DE and SE proposes to delete footnote (1) of Table 9.4 in BAT 18. The split view is also supported by EEB.

The split view is accompanied by the following rationale

- Small-scale plants are already excluded from the scope of the FMP BAT conclusions by the thresholds given in Annex I to the IED. Thus, there is no reason to further exempt installations with small mass flows from the BAT-AELs.
- The fact that some plants have lower emission mass flows than others is already accounted for by lowering the monitoring frequency for sources with low mass flows.
- In principle, the idea of mass flow thresholds is to accept a higher level of pollutant concentrations as long as the corresponding mass flows are sufficiently low. However, the data collection shows that between 47% and 63% in the case of HR, CR and HDC; 100% in the case of WD actually reported dust emissions from heating within a range up to 100 g/h. Hence, this is a typical emission mass flow for this type of emissions source and cannot be considered as insignificant.
- Moreover, most of the plants that reported dust emissions from heating below 100 g/h are actually in the BAT-AEL range, and achieve this by applying the techniques identified as BAT. It is not appropriate to exclude the majority of these plants.
- The mass flow threshold will be assessed by the competent authority when the permit is updated. For sources with dust emissions below 100 g/h, due to the application of efficient abatement measures, the BAT-AEL would not apply, even if the installation already complied with the BAT-AELs and thus no ELVs for emissions of dust would be specified. As a result, there is a big risk that operators may no longer undertake appropriate abatement measures or even switch off their abatement equipment when the new permit is implemented.
- The mass flow threshold opens up the possibility that some operators, in order to avoid the BAT-AEL, split the emissions into two or more emission points, all of which are below the threshold.
- The mass flow threshold lacks any definition and thereby threatens legal certainty and a level playing field. In particular, it is not specified how the mass flow shall be determined (e.g. based on maximum or average pollutant concentrations and waste gas flows) and there is no description of how or how often the waste gas flow shall be monitored.

Information on which the split view is based

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- Comment AT 11 (uploaded in BATIS on 6/11/2020) on the revised draft FMP BAT conclusions (published in BATIS on 9/10/2020);
- Comment AT 5 (uploaded in BATIS on 23/03/2020) on the revised draft FMP BAT conclusions (published in BATIS on 31/01/2020);
- Comment AT 24 (uploaded in BATIS on 23/03/2020) on the revised draft FMP BAT conclusions (published in BATIS on 31/01/2020);
- Comment DE 11 (uploaded in BATIS on 22/03/2020) on the revised draft FMP BAT conclusions (published in BATIS on 31/01/2020);
- Comment EEB 14 (uploaded in BATIS on 20/03/2020) on the revised draft FMP BAT conclusions (published in BATIS on 31/01/2020);
- Comment CZ 4 (uploaded in BATIS on 10/03/2020) on the revised draft FMP BAT conclusions (published in BATIS on 31/01/2020).

EIPPCB assessment
The documents and information referred to in the split view were available on time.

Validity of supporting rationale:

- For plants operating with natural gas only, the re-entrainment of dust from the feedstock in the furnaces is the main factor responsible for dust emissions.
- The data collection shows that indeed a large majority of plants exhibit a mass flow threshold lower than 100 g/h with dust emission concentrations below 10 mg/Nm^3 in both hot and cold rolling, wire drawing and hot dip coating. These plants principally use 100% natural gas.
- There are also a limited number of emission points exhibiting a mass flow threshold lower than 100 g/h and dust emission concentrations above 10 mg/Nm^3. For a number of these emission points, a high oxygen content in the waste gas (> 15%) was reported, which may explain the relatively high dust emission concentrations. Nevertheless, the data collection shows that there are a few emission points with low oxygen content in the waste gas (< 10%) and dust emission concentrations above 10 mg/Nm^3 (e.g. 92 HR1, 175 HR6, 175 HR7, 102 CR1, 102 CR2).
- In feedstock heating, none of the FMP plants from the data collection reported the use of secondary (end-of-pipe) techniques for abatement of dust. Only primary techniques (use of fuels with low dust and ash content and limiting the entrainment of dust from the feedstock in furnaces) have been identified as BAT. Therefore, there is no possibility that abatement systems are stopped at plants operating below the 100 g/h dust mass flow threshold.
- In the general considerations section (BAT-AELs and indicative emission levels for emissions to air) of the FMP BAT conclusions, a provision has been included to prevent the splitting of emissions between several stacks.

EIPPCB conclusion
Taking these aspects into account, the EIPPCB considers that the split view representing the opinion of AT, DE and SE fulfils the conditions set out in Section 4.6.2.3.2 of Commission Implementing Decision 2012/119/EU. This split view will therefore be reported in the "Concluding remarks and recommendations for future work" chapter of the BREF.

A possible formulation of this split view could be:

BAT conclusion	Dissenting view	Expressed by	Alternative proposed level (if any)
BAT 18 / Table 9.4	*Delete footnote ([1]).*	*AT, DE, SE, supported by EEB*	*NA*

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2.2.2 Higher end of BAT-AEL range for channelled SO_2 emissions to air from feedstock heating (EEB)

Conclusion of the meeting

Slides 157 – BAT 19 / Table 9.5:

Table 9.5: BAT-associated emission levels (BAT-AELs) for channelled SO_2 emissions to air from feedstock heating

Parameter	Sector	Unit	BAT-AEL (Daily average or average over the sampling period)
SO_2	Hot rolling	mg/Nm³	50–200 (¹) (²)
	Cold rolling, wire drawing, hot dip coating of sheets		20–100 (¹)

(¹) The BAT-AEL does not apply to plants using 100 % natural gas or 100 % electrical heating.
(²) The higher end of the BAT-AEL range may be ~~exceeded~~higher and up to 300 mg/Nm³ when using a high share of coke oven gas (~~e.g.~~ > 50 % of energy input). ~~In this case, the higher end of the BAT-AEL range is 300 mg/Nm³.~~

Split view summary

EEB proposes to amend footnote (²) as follows (the proposed amendment is indicated in bold):
"**Subject to a validated Article 15(4) IED derogation,** the higher end of the BAT-AEL range may be higher and up to 300 mg/Nm³ when using a high share of coke oven gas (>50% of energy input)."

The split view is accompanied by the following rationale

- This footnote allows installations to emit (up to 6 times) more sulphur dioxide, when a high share of coke oven gas (COG) is combusted, despite the fact that natural gas is the most standard fuel used in FMP processes; in which case SO_2 emissions are well below 10 mg/Nm³ (see Figure 2.45).
- Higher SO_2 emissions at the FMP plant due to combustion of COG correlate to a large extent to how BAT 48 of the Iron and Steel BREF (IS BREF) has been implemented. According to the IS BAT conclusions, COG can be desulphurised using absorption systems leading to a residual H_2S concentration within the range of 300-1 000 mg/Nm³ or using wet oxidative desulphurisation where residual H_2S concentrations are < 10 mg/Nm³.
- EEB considers that imposing on FMP plants only the possible use of COG desulphurised according to the wet oxidative technique does not go beyond the IS BAT conclusions. At integrated sites, it is counter-productive to allow a higher SO_2 BAT-AEL to the downstream FMP plant (in most cases from the same parent company) because it does not promote desulphurisation/pollution prevention upstream (at the coke ovens) or the implementation of pollution reduction techniques downstream (at the FMP plant).
- Analysis of the results of the data collection shows that:
  - There are a number of reference plants using fuels other 100% NG (including >50% COG) that achieve SO_2 emissions below the higher end of the BAT-AEL range (200 mg/Nm³), and even below 50 mg/Nm³, making such a footnote unnecessary. Such example plants are 158-HR2; 158-HR1, 221 HR2-1, 221 HR2-2 (75% COG), 37 HR1 and HR2 (>50% COG), 193 HR 3-3 (100% COG), 179 HR1 (75% COG), 179 HR1 (75% COG), 08-09 HR1 (100% COG), 08-09 HR1 (100% COG), 127 HR3-C (75% COG).
  - Reference Plant 179 HR2 reported a sulphur content of 1 777 mg/Nm³, exceeding the sulphur content specified in the IS BREF, but can nevertheless reach a SO_2 level of 150 mg/Nm³ over all the reference years with a COG share of 50%.
  - Only Plant 265 HR2 would rely on the application of the footnote based on the data provided; however, this plant reported very high sulphur content in the COG (5 030 mg/Nm³) and therefore this plant should be dismissed from defining the BAT-AEL.
- The FMP plant operator has options for controlling SO_2 emissions which are:
  - Request the COG provider to lower the sulphur content;
  - Blend COG gas with over low sulphur fuels;
  - Implement SO_2 emissions abatement downstream;
  - Switch to electrical heating.

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- The issue is therefore linked to the local coke oven characteristics and the availability of IS process gases, based on economic considerations for the operator who needs to decide whether the SO_2 emission reduction is proportionate to the cost of fuel switch / SO_2 abatement. Therefore, this is a typical example of an Article 15(4) IED derogation and the application of the footnote should be subject to an official Article 15(4) IED derogation where a cost-benefit assessment should be provided in a transparent manner.
- Although this proposal is linked to how footnote (²) may be implemented in the permit review phase and therefore could be considered as an implementation issue, EEB considers that this footnote has to be based on economic (cost-benefit) considerations rather than technical aspects.

Information on which the split view is based

- Comment provided by EEB on revised D1 (EEB 15);
- Comment provided by EEB on the revised BAT conclusion version circulated in October 2020 (EEB 7);
- Emissions data provided from reference plants indicated in the rationale found in Figure 2.46;
- At the Final Meeting, EUROFER stated that the fuel most commonly used is fossil gas and this is a commonly available fuel.

EIPPCB assessment

The documents and information referred to in the split view were available on time.

Validity of supporting rationale:

- BAT 48 of the IS BAT conclusions specifies that the residual H_2S concentration in the COG is in the range < 10-1 000 mg/Nm³. Desulphurisation of COG can be carried out with absorption systems (technique I) leading to residual H_2S concentrations within the range < 300-1 000 mg/Nm, or with wet oxidative processes (technique II), where residual H_2S concentrations < 10 mg/Nm³ can be achieved. A large majority of integrated steelworks in Europe currently employs, as a minimum requirement, technique I for COG desulphurisation. The IS BAT conclusions do not specify an order of priority for the use of technique II over technique I.
- Emission concentrations corresponding to a reported sulphur content in the COG clearly above 1 000 mg/Nm³ were associated with malfunctioning of the COG desulphurisation system at the coke ovens (OTNOC) and therefore were not considered in the determination of the BAT-AEL.
- The BAT conclusions are the reference for setting permit conditions based on the BAT-AEL range. On the other hand, Article 15(4) is used to set less stringent Emission Limit Values, if a valid assessment shows that BAT-AELs would lead to disproportionately higher costs compared to the environmental benefits. Therefore, it is not possible to mix the BAT conclusions and Article 15(4), which serve two very different purposes.
- The data collection shows, however, that some plants could achieve SO_2 emission concentrations below 200 mg/Nm³ even when using > 50% COG. For some of these plants, the sulphur content of the COG was typically lower than 600 mg/Nm³ and for some plants even lower than 100 mg/Nm³ (e.g. 08-09HR). This shows that it is technically possible to desulphurise COG down to relatively low sulphur levels. Accordingly, a higher end of the BAT-AEL range up to 300 mg/Nm³ could potentially be subject to a cost benefit-analysis (i.e. cost of further desulphurisation of the COG versus environmental benefit).

EIPPCB conclusion

Taking these aspects into account, the EIPPCB considers that the split view representing the opinion of EEB fulfils the conditions set out in Section 4.6.2.3.2 of Commission Implementing Decision 2012/119/EU. This split view will therefore be reported in the "Concluding remarks and recommendations for future work" chapter of the BREF.

A possible formulation of this split view could be:

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BAT conclusion	Dissenting view	Expressed by	Alternative proposed level (if any)
BAT 19 / Table 9.5	*Amend footnote (²) as follows: "The higher end of the BAT-AEL range may be higher and up to 300 mg/Nm³ when using a high share of coke oven gas (> 50% of energy input) and when the environmental benefit of thoroughly desulphurising COG would not be justified."*	*EEB*	*50-300 mg/Nm³*

2.2.3 Higher end of BAT-AEL range for channelled NO_X emissions to air from feedstock reheating (existing plants), intermediate heating and post-heating when using 100% NG and high air preheating (EUROFER, supported by CZ and PT)

Conclusion of the meeting

Slide 169 / BAT 20 / Table 9.6:

Table 9.6: BAT-associated emission levels (BAT-AELs) for channelled NO_X emissions to air and indicative emission levels for channelled CO emissions to air from feedstock heating in hot rolling

Parameter	Type of fuel	Specific process	Unit	BAT-AEL (Daily average or average over the sampling period)	Indicative emission level (Daily average or average over the sampling period)
NO_X	100 % natural gas	Reheating	mg/Nm³	New plants: 80–200 Existing plants: 100–~~300~~350	No indicative level
		Intermediate heating	mg/Nm³	100–250	
		Post-heating	mg/Nm³	100–200	

Split view summary

EUROFER (supported by CZ and PT) proposes to include a new footnote in Table 9.6 for reheating (existing plants), intermediate heating and post-heating when using 100% natural gas stating that: "The higher-end of the BAT-AEL range may be exceeded when high air preheating is applied. In this case, the higher end of the BAT-AEL range is 400 mg/Nm³".

The split view is accompanied by the following rationale

- When 100% NG is used in reheating, EUROFER provided information showing that, at low air preheating temperatures (< 200 °C), the variation in the NO_x emissions data is limited while at higher air preheating temperatures (> 200 °C), the variation in the NO_x emissions data increases rapidly. Some wit data points are as high as 1 500 mg/Nm³ at 3% O_2 and many others range between 500 mg/Nm³ and 1 000 mg/Nm³ at 3% O_2. Moreover, supporting information on increased NO_X concentration in relation to air preheating with NG is also available in the FMP BREF revised D1 (Figure 2.42), presenting data for plant 203 HR (lines 1 and 2) where the variation in the reported NO_X concentration over the 3-year period is most likely reflecting the variation in air preheating.
- Looking at NO_X emission data when 100% NG is used in intermediate heating and post-heating, EUROFER demonstrated that there is an increase in NO_X concentrations with increased air preheating temperature. As the air preheating temperature reaches 400 °C, only 3 out of 9 observations are clearly below the proposed higher end of the BAT-AEL range (200 mg/Nm³).
- The figures provided by EUROFER consist of repeated measurements from single furnaces and with the same fuel to try to isolate the effect of air preheating from the effects of other parameter changes.
- The situations where air preheating temperatures exceed 400°C correspond to heat treatment processes at higher temperatures.
- As the burner power increases, the waste gas temperature will increase, resulting in a higher air preheating temperature and NO_X emissions. As such, when using air preheating, the level NO_X concentration in the waste gas in a single measurement depends mainly on the power of the burner at the time of the measurement. EUROFER and other TWG members have provided and uploaded information in BATIS on the relationship between burner power and NO_X emissions.

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- For some heat treatments, e.g. post-heat treatment of heavy plates, radiant tube burners are used to achieve a uniform heat distribution, reduce scale formation and reduce energy consumption by achieving high air preheating. The use of radiant tube burners will make it impossible to use techniques (f), (g) and (h) (as acknowledged in the draft BAT conclusions) while applicability restrictions (lack of space and the need to be in the optimised temperature windows) also exist for techniques (i), (j) and (k).
- Operators at existing plants currently achieving NO_X levels above the higher end of the BAT-AEL range and forced to reduce the air preheating temperature (when other de-NO_X techniques are not applicable) will not necessarily decrease their NO_X mass emissions. Limiting the air preheating temperature must be compensated by the use of additional fuel for heating of ambient air, which counteracts the positive effects of reduced NO_X concentrations.
- As a large majority of existing plants use the air preheating technique with an average temperature of 400 °C, it cannot be assumed that all plants limiting air preheating will also be able to achieve the energy BAT-AEPLs.
- The specific impact of the air preheating temperature on NO_X emissions was already acknowledged in the 2001 FMP BREF. Prior to the KoM, EUROFER already drew the attention of the TWG to the correlation between NO_X emissions and air preheating indicating that "it is important to have in mind that energy efficiency and NO_X emissions are correlated, higher temperatures of preheated air usually result in higher NO_X emissions. Relation between air preheating and NO_X emissions must always be taken into consideration when proposing BAT-AELs''

Information on which the split view is based

- EUROFER proposed amendments to BAT 20 Tables 9.6 (HR), 9.7 (CR) and 9.9 (HDC) (uploaded in BATIS on 27/1/2021);
- EUROFER documents entitled 'Summary of submitted input on excess oxygen atmosphere and NO_X in reheating of stainless steel' (uploaded in BATIS on 18/1/2021);
- EUROFER document entitled 'Summary of submitted input on air preheating and NO_x emissions and proposal for revised NO_X BAT-AELs (BAT 20)' (uploaded in BATIS on 13/1/2021);
- EUROFER comments made on the revised FMP BREF draft BAT conclusions (October 2020 Version) (uploaded in BATIS on 6/11/2020)
- Comment PT 2 (uploaded in BATIS on 10/11/2020) on the revised draft FMP BAT conclusions (October 2020 Version published in BATIS on 9/10/2020);
- Comment PT 4 (uploaded in BATIS on 13/03/2020) on the revised draft FMP BAT conclusions (March 2020 Version published in BATIS on 13/03/2020);
- EUROFER submission entitled 'Air preheating in post-heat treatment for heavy plates: influence on NO_X emissions, applicability restrictions and technical presentations from suppliers' (uploaded in BATIS on 06/11/2020);
- EUROFER comments made on the revised FMP BREF BAT conclusions (March 2020 Version) (uploaded in BATIS on 20/3/2020);
- EUROFER document entitled 'List of critical issues to address during FMP BREF Final Meeting' (uploaded in BATIS on 20/3/2020);
- EUROFER document entitled 'NO_X emissions and air preheating correlation' (uploaded in BATIS on 20/3/2020);
- EUROFER submission to be included in the FMP BREF entitled 'List of steel products' (uploaded in BATIS on 20/3/2020);
- EUROFER document entitled 'input post 2nd FMP BREF data assessment workshop' (uploaded in BATIS on 17/12/2019);
- EUROFER comments to the key topics listed for the FMP 2nd Data Workshop (uploaded in BATIS on 26/11/2019);
- IT submission showing a correlation between NO_X concentration and temperature of preheated combustion air (uploaded in BATIS on 7/6/2019);
- EUROFER document entitled 'List of actions undertaken from the FMP Data Workshop on 23-24/01/2019 to improve the data basis' (uploaded in BATIS on 6/2/2019);

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- EUROFER document entitled 'Relation between NO_X and air preheating at ArcelorMittal Bremen' (uploaded in BATIS on 6/2/2019);
- EUROFER submission to be included in the FMP BREF providing example plot with continuous measurements of NO_X emissions from furnaces over the year provided by ArcelorMittal Fos' (uploaded in BATIS on 6/2/2019);
- EUROFER comments on the Draft Graphs and the Data Tables submitted by the EIPPCB on 14/12/2018 (uploaded in BATIS on 21/1/2019);
- EUROFER inputs on new or amended BAT candidates (uploaded in BATIS on 4/9/2018);
- EUROFER document entitled 'Template for FMP KEI initial positions - EUROFER position' (uploaded in BATIS on 29/4/2016);
- EUROFER document entitled 'Update wish-list EUROFER' (uploaded in BATIS on 1/2/2016).

EIPPCB assessment
The documents and information referred to in the split view were available on time.

Validity of supporting rationale:

- A number of examples have been provided by EUROFER showing, for specific plants, correlations between the air preheating temperatures and NO_X emissions, and between the power of the furnace burners at the time of the emission measurement and the NO_X emissions.
- Data on the power of the furnace burners (at the time emission measurements were carried out) were not collected in the questionnaires.
- The data collection shows that there are example plants using high air preheating temperatures (e.g. > 400°C) with maximum NO_X emission concentrations above 350 mg/Nm³ when using 100% natural gas, even though these plants do not constitute the majority of the cases observed in the data set.

EIPPCB conclusion
Taking these aspects into account, the EIPPCB considers that the split view representing the opinion of EUROFER supported by CZ and PT fulfils the conditions set out in Section 4.6.2.3.2 of Commission Implementing Decision 2012/119/EU. This split view will therefore be reported in the "Concluding remarks and recommendations for future work" chapter of the BREF.

A possible formulation of this split view could be:

BAT conclusion	Dissenting view	Expressed by	Alternative proposed level (if any)
BAT 20 / Table 9.6	*Include a new footnote for reheating (existing plants), intermediate heating and post-heating when using 100% natural gas as follows: "The higher end of the BAT-AEL range may be exceeded when high air preheating is applied. In this case, the higher end of the BAT-AEL range is 400 mg/Nm³."*	*EUROFER supported by CZ and PT*	*400 mg/Nm³*

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2.2.4 Higher end of BAT-AEL range for channelled NOx emissions to air from feedstock reheating, intermediate heating and post-heating when using fuels other than 100% NG and high air preheating (EUROFER, supported by CZ and SK)

Conclusion of the meeting

Slide 169 / BAT 20 / Table 9.6:

Table 9.6: BAT-associated emission levels (BAT-AELs) for channelled NOx emissions to air and indicative emission levels for channelled CO emissions to air from feedstock heating in hot rolling

Parameter	Type of fuel	Specific process	Unit	BAT-AEL (Daily average or average over the sampling period)	Indicative emission level (Daily average or average over the sampling period)
NO_x	Other fuels	Reheating, intermediate heating, post-heating	mg/Nm³	100–350 ([1])	No indicative level
([1]) The higher end of the BAT-AEL range may be exceeded when using a high share of coke oven gas or of CO-rich gas from ferrochromium production (~~e.g.~~ > 50 % of energy input). In this case, the higher end of the BAT-AEL range is 550 mg/Nm³.					

Split view summary

EUROFER (supported by CZ and SK) proposes to include a new footnote in Table 9.6 for reheating, intermediate heating and post-heating when using other fuels stating that:

"The higher end of the BAT-AEL range is 500 mg/Nm³ when high air preheating is applied and when the share of coke oven gas or of CO-rich gas from ferrochromium production is below 50% of energy input.

If high air preheating is used in combination with a high share of coke oven gas or of CO-rich gas from ferrochromium production (> 50% of energy input), the higher end of the BAT-AEL range is 800 mg/Nm³".

The split view is accompanied by the following rationale

- Information showing a correlation between NO_x emissions and air preheating has been provided by a TWG member for the Oxelösund plant (243). This information is incorporated into the FMP BREF revised D1 (Figures 8.41 and 2.41). In particular, Figure 8.41 shows hourly NO_x emission concentrations measured continuously from a reheating furnace prior to rolling (COG > 95%). Figure 2.41 shows NO_x emission concentrations measured from a furnace used for the post-heating treatment of plates (100% COG). The furnaces are using low-NO_x burners and when the feedstock is heated above 900°C (normalising), the air preheating temperature is > 400°C and the NO_x emission concentrations are > 700 mg/Nm³ at 3% O_2. Both figures clearly demonstrate the existence of a correlation between NO_x emissions and air preheating.
- The rationales provided by EUROFER in the previous Section 2.2.3 related to the effect of burner power on NO_x emissions, the applicability restrictions of some of the techniques identified as BAT for NOx emissions reduction, and the relationship between limiting air preheating and increasing energy consumption are also valid for this split view but they are not repeated again here.

Information on which the split view is based

- EUROFER proposed amendments to BAT 20 Tables 9.6 (HR), 9.7 (CR) and 9.9 (HDC) (uploaded in BATIS on 27/1/2021);
- EUROFER document entitled 'Summary of submitted input on air preheating and NO_x emissions and proposal for revised NOx BAT-AELs (BAT 20)' (uploaded in BATIS on 13/1/2021);

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- EUROFER comments made on the revised FMP BREF draft BAT conclusions (October 2020 Version) (uploaded in BATIS on 6/11/2020)
- EUROFER submission entitled 'Air preheating in post-heat treatment for heavy plates: influence on NO_X emissions, applicability restrictions and technical presentations from suppliers' (uploaded in BATIS on 06/11/2020);
- EUROFER comments made on the revised FMP BREF BAT conclusions (March 2020 Version) (uploaded in BATIS on 20/3/2020);
- EUROFER document entitled 'List of critical issues to address during FMP BREF Final Meeting' (uploaded in BATIS on 20/3/2020);
- EUROFER document entitled 'NO_X emissions and air preheating correlation' (uploaded in BATIS on 20/3/2020);
- EUROFER submission to be included in the FMP BREF entitled 'List of steel products' (uploaded in BATIS on 20/3/2020);
- EUROFER document entitled 'input post 2nd FMP BREF data assessment workshop' (uploaded in BATIS on 17/12/2019);
- EUROFER comments to the key topics listed for the FMP 2nd Data Workshop (uploaded in BATIS on 26/11/2019);
- EUROFER document entitled 'NO_X emissions example from CELSA NORDIC' (uploaded in BATIS on 12/2/2019);
- EUROFER document entitled 'List of actions undertaken from the FMP Data Workshop on 23-24/01/2019 to improve the data basis' (uploaded in BATIS on 6/2/2019);
- EUROFER document entitled 'Relation between NO_X and air preheating at ArcelorMittal Bremen' (uploaded in BATIS on 6/2/2019);
- EUROFER submission to be included in the FMP BREF providing example plot with continuous measurements of NOx emissions from furnaces over the year provided by ArcelorMittal Fos' (uploaded in BATIS on 6/2/2019);
- EUROFER submission to be included in the FMP BREF providing example plot with continuous measurements of NO_X emissions from furnaces provided by Tata Steel IJmuiden showing NO_X fluctuations over the year (uploaded in BATIS on 6/2/2019);
- EUROFER comments on the Draft Graphs and the Data Tables submitted by the EIPPCB on 14/12/2018 (uploaded in BATIS on 21/1/2019);
- EUROFER inputs on new or amended BAT candidates (uploaded in BATIS on 4/9/2018);
- EUROFER document entitled 'Template for FMP KEI initial positions - EUROFER position' (uploaded in BATIS on 29/4/2016);
- EUROFER document entitled 'Update wish-list EUROFER' (uploaded in BATIS on 1/2/2016);
- FMP BREF (2001 version).

EIPPCB assessment
The documents and information referred to in the split view were available on time.

Validity of supporting rationale:

- For a specific plant (243 HR), the information supplied by EUROFER indicates a correlation between high air preheating temperatures and NO_X emissions.
- The data collection shows that there are a few examples plants using high air preheating temperatures (e.g. > 400 °C) with maximum NO_X emission concentrations above 350 mg/Nm³ when using less than 50% COG in the fuel mix.
- The data collection shows that there are some example plants using high air preheating temperatures (e.g. > 400 °C) with maximum NO_X emission concentrations above 550 mg/Nm³ when using more than 50% COG in the fuel mix.

EIPPCB conclusion
Taking these aspects into account, the EIPPCB considers that the split view representing the opinion of EUROFER supported by CZ and SK fulfils the conditions set out in Section 4.6.2.3.2 of Commission Implementing Decision 2012/119/EU. This split view will therefore be reported in the "Concluding remarks and recommendations for future work" chapter of the BREF.

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A possible formulation of this split view could be:

BAT conclusion	Dissenting view	Expressed by	Alternative proposed level (if any)
BAT 20 / Table 9.6	*Include a new footnote for reheating, intermediate heating and post-heating when using other fuels as follows:* *"The higher end of the BAT-AEL range is 500 mg/Nm³ when high air preheating is applied and when the share of coke oven gas or of CO-rich gas from ferrochromium production is < 50% of energy input.* *If high air preheating is used in combination with a high share of coke oven gas or of CO-rich gas from ferrochromium production (> 50% of energy input), the higher end of the BAT-AEL range is 800 mg/Nm³".*	*EUROFER, supported by CZ and SK*	*500 mg/Nm³ (with high air preheating and a share of coke oven gas or of CO-rich gas from ferrochromium production < 50% of energy input)* *800 mg/Nm³ (with high air preheating and a share of coke oven gas or of CO-rich gas from ferrochromium production > 50% of energy input)*

2.2.5 Higher end of BAT-AEL range for channelled NOx emissions to air from feedstock reheating, intermediate heating and post-heating when using fuels other than 100% NG (EEB)

Conclusion of the meeting

Slide 169 / BAT 20 / Table 9.6:

Table 9.6: BAT-associated emission levels (BAT-AELs) for channelled NOx emissions to air and indicative emission levels for channelled CO emissions to air from feedstock heating in hot rolling

Parameter	Type of fuel	Specific process	Unit	BAT-AEL (Daily average or average over the sampling period)	Indicative emission level (Daily average or average over the sampling period)
NO_x	Other fuels	Reheating, intermediate heating, post-heating	mg/Nm³	100–350 (1)	No indicative level
(1) The higher end of the BAT-AEL range may be exceeded when using a high share of coke oven gas or of CO-rich gas from ferrochromium production (~~e.g.~~ > 50 % of energy input). In this case, the higher end of the BAT-AEL range is 550 mg/Nm³.					

Split view summary

EEB proposes to delete footnote (1) or to amend it as follows (proposed amendments are in bold): **Subject to a validated Article 15(4) IED derogation, the higher end of the BAT-AEL range may be higher and up to** 550 mg/Nm³ when using a high share of coke oven gas or of CO-rich gas from ferrochromium production (>50% of energy input).

The split view is accompanied by the following rationale

- First, a wording alignment ('*may be higher and up to*') is proposed to adapt to the formulation used in other similar BAT conclusions (e.g. BAT 19 and Table 9.25 - conclusion slide 108).
- The rationale behind this split view is consistent with the rationale provided previously for BAT 19 (footnote (2)). Footnote 1 allows to emit (up to 5.5 times) more NO_x, when a high share of COG or CO rich gas from ferrochromium production is combusted, despite the fact that the application of secondary De-NO_x techniques (SCR/SNCR) would enable not to exceed NO_x emissions of 200 mg/Nm³, irrespectively of the fuel types used.
- The BAT examples from the Nordic iron and steel industry report mentions that SCR is applied in the FMP sector for various emission sources, such as mixed acid pickling, annealing rolling lines, with a "typical NO_x reduction efficiency of 70-90%". The information is from 2015 and refers to an existing plant (Outokumpu Stainless Tornio Plant in Finland, See Page 98 of this report).
- In particular, EEB considers that footnote (1) is unnecessary for the following reasons:
  - The FMP plant operator has options for controlling NO_x emissions including blending COG with fuels having lower NO_x formation potential, switching to electrical heating, or implementing secondary abatement techniques such as SCR or SNCR.
  - The data supplied by the reference plants justify a higher end of the BAT-AEL range up to 200 mg/Nm³. For instance, reference plants 08-09 HR8, 37 HR1, 178 HR2, 221 HR2-2, 37 HR1-C, 110 HR2-2C reported values below 200 mg/Nm³ despite using fuels other than NG (above 50%). All these plants (except 110) apply primary techniques. The same applies to post-heating furnaces (See reference plants 94 HR2-3, 157 HR1-4, 08-09 HR3, 300 HR2, 300 HR3, 243 HR 5).
  - If concentrations above 200 mg/m³ occur, specific abatement techniques can be applied, especially SCR. One reference plant actually uses the SCR technique (110 HR2, Tata Steel Ijmuiden). This plant achieved yearly average values between 197 and 224 mg/Nm³. The share of coke oven gas was between 45% and 55%. It demonstrates that SCR is applicable even when the share of coke oven gas is above 50%.

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   - SNCR to abate NOx-emissions can be applied at FMP plants. Optimised reaction conditions can be achieved if a sufficient long reaction line is realised in combination with effective temperature monitoring and the installation of ammonia injection. This technique is applied at many waste incineration plants which can achieve NO_x emissions below 100 mg/Nm^3.
- At the final meeting, industry indicated the need to maintain footnote (1) due to cost-benefit considerations (related to de-NO_x techniques) and the availability of fuels with low NO_x formation potential. This is a typical example of an Article 15(4) IED derogation and the application of the footnote should be subject to an official Article 15(4) IED derogation where a cost-benefit assessment should be provided in a transparent manner.
- Although this proposal is linked to how footnote ([1]) may be implemented in the permit review phase and therefore could be considered as an implementation issue, EEB considers that this footnote has to be based on economic (cost-benefit) considerations rather than technical aspects.

Information on which the split view is based
- Comments provided by EEB on revised D1 (EEB 16 and EEB 17);
- Comment provided by EEB on the revised BAT conclusion version circulated in October 2020 (EEB 8);
- Emissions data provided from reference plants indicated in the rationale found in Figures 2.50 and 2.51;
- BAT examples from the Nordic iron and steel industry (Available in BATIS – Reference N. 174 of the FMP BREF)
- Questionnaire for Plant 110 HR-2 (NO_X emissions with SCR);
- WI BREF (available at https://eippcb.jrc.ec.europa.eu/reference/waste-incineration-0) providing information on optimised SNCR).

EIPPCB assessment
The documents and information referred to in the split views were available on time.

Validity of supporting rationale:
- The data collection shows that there is only one HR plant (in reheating) which reported the use of SCR as an end-of-pipe abatement technique for NO_X emissions.
- SCR/SNCR is not always applicable in hot rolling and cold rolling plants; a number of applicability restrictions have been included in the BATC for these two techniques (techniques (i) and (j) / BAT 20). In particular, for SNCR, the temperature of the waste gases in FMP furnaces is usually low compared to the optimum operating temperature window. The use of SNCR has not been reported at any of the plants from the data collection.
- The BAT conclusions are the reference for setting permit conditions based on the BAT-AEL range. On the other hand, Article 15(4) is used to set less stringent Emission Limit Values, if a valid assessment shows that BAT-AELs would lead to disproportionately higher costs compared to the environmental benefits. Therefore, it is not possible to mix the BAT conclusions and Article 15(4), which serve two very different purposes.
- The higher end of the BAT-AEL range is set at 350 mg/Nm^3 when using fuels other than 100% NG. Only a minority of plants have reported NO_X emission concentrations below 200 mg/Nm^3 under such conditions and therefore it is unclear why the higher end of the BAT-AEL should be set at 200 mg/Nm^3 instead.
- There are a number of emission points in the data collection using > 50% COG that did not achieve NO_X emission concentrations below 350 mg/Nm^3. For this reason, footnote ([1]) was included.

EIPPCB conclusion
Taking these aspects into account, the EIPPCB considers that the split view representing the opinion of EEB does not fulfil the conditions set out in Section 4.6.2.3.2 of Commission Implementing Decision 2012/119/EU. This split view will therefore not be reported in the "Concluding remarks and recommendations for future work" section of the BREF.

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2.2.6 Higher end of BAT-AEL range for channelled NOx emissions to air from feedstock reheating, intermediate heating and post-heating when processing high-alloy steels (EUROFER)

Conclusion of the meeting
Slides 169-170 / BAT 20 / Table 9.7:

Table 9.6: BAT-associated emission levels (BAT-AELs) for channelled NOx emissions to air and indicative emission levels for channelled CO emissions to air from feedstock heating in hot rolling

Parameter	Type of fuel	Specific process	Unit	BAT-AEL (Daily average or average over the sampling period)	Indicative emission level (Daily average or average over the sampling period)
NO_X	100 % natural gas	Reheating	mg/Nm^3	New plants: 80–200 Existing plants: 100–~~200~~350	No indicative level
		Intermediate heating	mg/Nm^3	100–250	
		Post-heating	mg/Nm^3	100–200	
	Other fuels	Reheating, intermediate heating, post-heating	mg/Nm^3	100–350 (1)	
(1) The higher end of the BAT-AEL range may be exceeded when using a high share of coke oven gas or of CO-rich gas from ferrochromium production (~~e.g.~~ > 50 % of energy input). In this case, the higher end of the BAT-AEL range is 550 mg/Nm^3.					

Split view summary
EUROFER proposes to include a new footnote in Table 9.6 for reheating (new and existing plants) when using 100% NG and reheating, intermediate heating and post-heating when using other fuels for processing high-alloy steels, e.g. stainless steel, stating that: "The higher-end of the BAT-AEL range may be exceeded when processing high-alloy steels, e.g. stainless steel. In this case, the higher end of the BAT-AEL range is 450 mg/Nm^3".

The split view is accompanied by the following rationale

- In the hot rolling of stainless steel slabs, the aim of the treatment in the furnaces is to enhance the metallurgical properties of the steel. For stainless steel and high-alloy steels (see Section 11.3 of the FMP BREF revised D1), this requires specific circumstances such as excess oxygen and higher temperatures to stimulate the formation of an oxide layer (scale).
- Without a sufficiently thick and uniform scale formed during reheating in hot rolling, direct contact between the bare metal surface and the surface of the work roll will eventually occur, causing the formation of a surface defect called 'sticking'. The formation of such defects inevitably causes the deterioration of the surface quality of the final product, causing yield losses and a need to reprocess the non-marketable material. By increasing the oxygen content from 4% to 10%, the amount of scale formed increases by approximately 19%, measured by the mass change of the test specimen. For stainless steel, an oxidising atmosphere with minimum 5-7% oxygen is needed.
- The occurrence of excess oxygen in the combustion process is a fact well known for having an impact on higher NO_X concentration in the waste gas. For this reason, the specific circumstances required to achieve metallurgical properties of the steel in stainless will also result in higher NO_X emissions.
- The proposed BAT-AEL ranges for NO_X do not take into account the process constraints of an excess oxygen atmosphere (high O_2) and high temperature needed to achieve the quality

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requirements in heating of stainless steel before rolling. These necessary circumstances cause higher NO_X formation and must be addressed.

- Collected data for stainless steel during the review process (11 installations, SE plants not included due to expression of emission values in mg/MJ) show a mean value for NO_X of the 'average observations' of 348 mg/Nm³ at 3% O_2, almost equal to the proposed upper end of the BAT-AEL range for reheating using either NG or other fuels (350 mg/Nm³ at 3% O_2). Analysing the variation of the data shows a mean value of the 'maximum observations' of 450 mg/Nm³ at 3% O_2.
- The upper end of the BAT-AEL range must include the variations that arise from different furnaces and processes in combination with suggested BAT techniques. The upper end of the BAT-AEL range is currently not representative of stainless steel processing. To ensure the future possibility to produce high-quality stainless steel, the upper end of the BAT-AEL must be increased to cover the mean value of the average and maximum observations relating to stainless steel.

Information on which the split view is based

- EUROFER document entitled 'Summary of submitted input on excess oxygen atmosphere and NO_X in reheating of stainless steel' (uploaded in BATIS on 18/1/2021);
- EUROFER comments made on the revised FMP BREF draft BAT conclusions (October 2020 Version) (uploaded in BATIS on 6/11/2020)
- EUROFER document entitled 'List of critical issues to address during FMP BREF Final Meeting' (uploaded in BATIS on 20/3/2020);
- EUROFER document entitled 'Emissions to air from heating: BAT 18, BAT 19 and BAT 20' (uploaded in BATIS on 20/3/2020);
- EUROFER submission to be included in the FMP BREF entitled 'List of steel products' (uploaded in BATIS on 20/3/2020);
- FI comments made on the revised FMP BREF BAT conclusions (March 2020 Version) (uploaded in BATIS on 6/3/2020);
- EUROFER comments to the key topics listed for the FMP 2nd Data Workshop (uploaded in BATIS on 26/11/2019);
- Compiled list of comments on D1 (uploaded in BATIS by the EIPPCB on 17/6/2019).

EIPPCB assessment

The documents and information referred to in the split view were available on time.

Validity of supporting rationale:

- Information on the measured oxygen content in the waste gas was not systematically reported in the questionnaires. Sometimes, plants directly reported the emission concentration values already corrected to 3% O_2 or 5% O_2 without giving any further information on the actual measured value in the waste gas.
- However, there is evidence from the data collection that reheating, intermediate heating and post-heating furnaces producing high-alloy steel are operating under conditions where the oxygen content in the waste gases exceeds 5-7%.
- In reheating when using 100% NG and in reheating, intermediate heating and post-heating when using other fuels, the data collection shows that some emission points reported maximum NO_X emission concentrations > 350 mg/Nm³ with a measured oxygen content in the waste gas above 10%.

EIPPCB conclusion

Taking these aspects into account, the EIPPCB considers that the split view representing the opinion of EUROFER fulfils the conditions set out in Section 4.6.2.3.2 of Commission Implementing Decision 2012/119/EU. This split view will therefore be reported in the "Concluding remarks and recommendations for future work" chapter of the BREF.

A possible formulation of this split view could be:

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BAT conclusion	Dissenting view	Expressed by	Alternative proposed level (if any)
BAT 20 / Table 9.6	*Include a new footnote for reheating (new and existing plants) when using 100% NG, and for reheating, intermediate heating and post-heating when using other fuels as follows: "The higher end of the BAT-AEL range may be exceeded when processing high-alloy steels, e.g. stainless steel. In this case, the higher end of the BAT-AEL range is 450 mg/Nm³."*	*EUROFER*	*450 mg/Nm³*

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2.2.7 Higher end of BAT-AEL range for channelled NOx emissions to air from high-temperature heat treatment in feedstock post-heating when using 100% NG (EUROFER)

Conclusion of the meeting

Slide 169 / BAT 20 / Table 9.6:

Table 9.6: BAT-associated emission levels (BAT-AELs) for channelled NOx emissions to air and indicative emission levels for channelled CO emissions to air from feedstock heating in hot rolling

Parameter	Type of fuel	Specific process	Unit	BAT-AEL (Daily average or average over the sampling period)	Indicative emission level (Daily average or average over the sampling period)
NO_X	100 % natural gas	Post-heating	mg/Nm³	100–200	No indicative level

Split view summary

EUROFER proposes to amend the higher end of the BAT-AEL range to 250 mg/Nm³ for high temperature heat treatment in post-heating when using 100% NG.

The split view is accompanied by the following rationale summary

- When looking at Figure 2.65 of the FMP BREF revised D1, approximately 30-40% of the heat treatment furnaces have a variation in the emission level that exceeds the upper level of the BAT-AEL (200 mg/Nm³).
- Figure 2.65 of the FMP BREF revised D1 shows many specific heat treatment processes result in lower air preheating temperatures. However, high-temperature processes resulting in higher air preheating temperatures (>400 °C) often occur in post-heating. In particular, this is the case when the feedstock is heated up to 900 °C (normalising).
- Such high-temperature heating of materials is used in all processes in general, and specifically in post-heating in HR.
- Moreover, post-heating furnaces operate more intermittently and use many different heating regimes to achieve specific physical or mechanical properties. Therefore, the process can be less efficient than other heating processes in HR, where the objective is to heat the rolling stock as quickly and uniformly as possible to rolling temperature.

Information on which the split view is based

- EUROFER proposed amendments to BAT 20 Tables 9.6 (HR), 9.7 (CR) and 9.9 (HDC) (uploaded in BATIS on 27/1/2021);
- EUROFER document entitled 'Summary of submitted input on air preheating and NO_x emissions and proposal for revised NO_X BAT-AELs (BAT 20)' (uploaded in BATIS on 13/1/2021);
- EUROFER comments made on the revised FMP BREF draft BAT conclusions (October 2020 Version) (uploaded in BATIS on 6/11/2020)
- EUROFER submission to be included in the FMP BREF entitled 'List of steel products' (uploaded in BATIS on 20/3/2020);
- Comment ES 20 on the revised draft FMP BAT conclusions (March 2020);
- Comment IT 25 on the FMP BREF D1.

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EIPPCB assessment

The documents and information referred to in the split view were available on time.

Validity of supporting rationale:

- A large majority of post-heating furnaces in the data collection are operating with 100% NG, high air preheating temperatures (> 400°C) and/or high target temperatures (> 900°C) that reported NO_X emission concentrations below the higher end of the BAT-AEL range (i.e. < 200 mg/Nm^3). However, under the same operating conditions, there are a limited number of plants that also reported NO_X emission concentrations above the higher end of the BAT-AEL range (i.e. > 200 mg/Nm^3).

EIPPCB conclusion

Taking these aspects into account, the EIPPCB considers that the split view representing the opinion of EUROFER fulfils the conditions set out in Section 4.6.2.3.2 of Commission Implementing Decision 2012/119/EU. This split view will therefore be reported in the "Concluding remarks and recommendations for future work" chapter of the BREF.

A possible formulation of this split view could be:

BAT conclusion	Dissenting view	Expressed by	Alternative proposed level (if any)
BAT 20 / Table 9.6	*Increase the higher end of the BAT-AEL range for NO_X emissions in feedstock post-heating when using 100% natural gas to 250 mg/Nm^3.*	*EUROFER*	*250 mg/Nm^3*

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2.2.8 Higher end of BAT-AEL range for channelled NOx emissions to air from feedstock heating in cold rolling when using 100% NG and high air preheating (EUROFER, supported by SK)

Conclusion of the meeting

Slide 174 / BAT 20 / Table 9.7:

Table 9.7: BAT-associated emission levels (BAT-AELs) for channelled NO_X emissions to air and indicative emission levels for channelled CO emissions to air from feedstock heating in cold rolling

Parameter	Type of fuel	Unit	BAT-AEL (Daily average or average over the sampling period)	Indicative emission level (Daily average or average over the sampling period)
NO_X	100 % natural gas	mg/Nm³	100–250 (*)	No indicative level
(*) The higher end of the BAT-AEL range may be exceeded in continuous annealing. In this case, the higher end of the BAT-AEL range is 300 mg/Nm³.				

Split view summary

EUROFER (supported by SK) proposes to include a new footnote in Table 9.7 when using 100% natural gas stating that: "For existing plants, the higher end of the BAT-AEL range may be exceeded when high air preheating is applied. In this case, the higher end of the BAT-AEL range is 400 mg/Nm³".

The split view is accompanied by the following rationale summary

- Analysis of the data for batch annealing (Figure 3.45 of the FMP BREF revised D1) shows that, depending on when the NO_X measurement took place, the NO_X value is influenced by variable air preheating temperatures. The higher NO_X values are associated with higher annealing temperatures (700-750 °C) which are 50-100°C higher than most of the other plants (see 209 CR-2; 115 CR-1; 45 CR-1; 45 CR-2; 209 CR-3). EUROFER provided an analysis of Figure 3.45 of the FMP BREF revised D1, where a clear tendency for higher NO_X values when the operating temperature is higher than 700 °C and up to 750 °C can be seen. In particular, there are a number of values reaching 400 mg/Nm³, both for maximum concentrations and average concentrations. These higher annealing temperatures are associated with higher air preheating temperature (> 400 °C) to save energy. See Figure 3.31 in Chapter 3 of the FMP BREF revised D1, showing an example for Plant CR115 where clear evidence is given of higher air preheating temperatures up to 550 °C.
- In Figure 3.45, Plant CR115 (with a high annealing temperature) is the only plant with flue-gas recirculation but still only able to achieve 281-315 mg/Nm³. This has to be taken into account when balancing low-NO_X techniques versus using air preheating to improve energy consumption.
- New measurements were reported by a MS for Plant 158 CR-1 following the installation of new low-NO_X burners in 2017-2018 and with NG used as a fuel. Some of the very first measurements show values above 250 mg/Nm³ at 3% O_2 (165-255 mg/Nm³). The TWG member concluded that when air preheating is applied, it may not be possible to keep NO_x emissions below 250 mg/Nm³.
- It is important to take into account the maximum concentrations when deriving BAT-AELs because they show the magnitude of the variation of NO_X emissions when using air preheating.
- In batch annealing, it is very difficult to implement BAT 20 techniques (i), (j) and (k): there are no batch annealing lines with SCR known in Europe and SNCR is not possible because the temperature range of this technique is not achieved. This is acknowledged in the draft BAT conclusions.
- In Figure 3.45 of the FMP BREF revised D1, continuous annealing lines are using radiant tube burners. The use of radiant tube burners will make it impossible to use BAT 20 techniques f, g and h (as acknowledged in the draft BAT conclusions) while applicability restrictions (lack of

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space and the need to be in the optimised temperature windows) also exist for techniques (i), (j) and (k).

- The rationale provided by EUROFER in Section 2.2.3 related to the effect of burner power on NO_x emissions and the relationship between limiting air preheating and increasing energy consumption are also valid for this split view but are not repeated again here.

Information on which the split view is based

- EUROFER proposed amendments to BAT 20 Tables 9.6 (HR), 9.7 (CR) and 9.9 (HDC) (uploaded in BATIS on 27/1/2021);
- EUROFER document entitled 'Summary of submitted input on air preheating and NO_x emissions and proposal for revised NO_X BAT-AELs (BAT 20)' (uploaded in BATIS on 13/1/2021);
- DE comments made on the revised FMP BREF BAT conclusions (October 2020 Version) (uploaded in BATIS on 7/11/2020);
- DE document entitled 'Sample calculation for NO_X reduction by limiting air preheating in batch annealing furnaces' (uploaded in BATIS on 7/11/2020);
- EUROFER comments made on the revised FMP BREF BAT conclusions (October 2020 Version) (uploaded in BATIS on 6/11/2020)
- EUROFER document entitled 'Surplus energy when limiting air preheating in batch annealing' (uploaded in BATIS on 6/11/2020);
- EUROFER comments made on the revised FMP BREF BAT conclusions (March 2020 Version) (uploaded in BATIS on 20/3/2020);
- EUROFER document entitled 'List of critical issues to address during FMP BREF Final Meeting' (uploaded in BATIS on 20/3/2020);
- EUROFER document entitled 'Additional comments on NO_X and air preheating in batch annealing' (uploaded in BATIS on 20/3/2020);
- Figure 3.32 – NO_X emissions from feedstock heating in CR using 100% NG (uploaded in BATIS on 20/3/2020);
- EUROFER document entitled 'input post 2nd FMP BREF data assessment workshop' (uploaded in BATIS on 17/12/2019);
- EUROFER comments to the key topics listed for the FMP 2nd Data Workshop (uploaded in BATIS on 26/11/2019);
- EUROFER document entitled 'List of actions undertaken from the FMP Data Workshop on 23-24/01/2019 to improve the data basis' (uploaded in BATIS on 6/2/2019);
- EUROFER comments on the Draft Graphs and the Data Tables submitted by the EIPPCB on 14/12/2018 (uploaded in BATIS on 21/1/2019);
- EUROFER inputs on new or amended BAT candidates (uploaded in BATIS on 4/9/2018);
- EUROFER document entitled 'Template for FMP KEI initial positions - EUROFER position' (uploaded in BATIS on 29/4/2016);
- EUROFER document entitled 'Update wish-list EUROFER' (uploaded in BATIS on 1/2/2016);
- FMP BREF (2001 version).

EIPPCB assessment

The documents and information referred to in the split view were available on time.

Validity of supporting rationale:

- The applicability of SCR/SNCR in batch annealing was discussed during the final meeting and it was acknowledged that the applicability of these techniques may be restricted due to the varying temperatures during the annealing cycle. Furthermore, for SNCR, the applicability is also restricted by the optimum temperature window and the residence time needed for the reaction.
- The data collection shows that there are batch annealing and continuous annealing plants using 100% NG with annealing temperatures ≥ 700 °C which reported NO_X emission concentrations

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above the higher end of the BAT-AEL range (i.e. 250 mg/Nm³ for batch annealing and 300 mg/Nm³ for continuous annealing).

EIPPCB conclusion
Taking these aspects into account, the EIPPCB considers that the split view representing the opinion of EUROFER and SK fulfils the conditions set out in Section 4.6.2.3.2 of Commission Implementing Decision 2012/119/EU. This split view will therefore be reported in the "Concluding remarks and recommendations for future work" chapter of the BREF.

A possible formulation of this split view could be:

BAT conclusion	Dissenting view	Expressed by	Alternative proposed level (if any)
BAT 20 / Table 9.7	*Amend footnote (²) as follows: "The higher end of the BAT-AEL range may be exceeded when high air preheating is applied. In this case, the higher end of the BAT-AEL range is 400 mg/Nm³."*	*EUROFER, SK*	*400 mg/Nm³*

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2.2.9 Higher end of BAT-AEL range for channelled NOx emissions to air from feedstock heating in cold rolling when using fuels other than 100% NG and high air preheating (EUROFER, supported by SK)

Conclusion of the meeting

Slide 174 / BAT 20 / Table 9.7:

Table 9.7: BAT-associated emission levels (BAT-AELs) for channelled NO_X emissions to air and indicative emission levels for channelled CO emissions to air from feedstock heating in cold rolling

Parameter	Type of fuel	Unit	BAT-AEL (Daily average or average over the sampling period)	Indicative emission level (Daily average or average over the sampling period)
NO_x	Other fuels	mg/Nm³	100–300 ([1])	No indicative level

([1]) The higher end of the BAT-AEL range may be exceeded when using a high share of coke oven gas or of CO-rich gas from ferrochromium production (~~e.g.~~ > 50 % of energy input). In this case, the higher end of the BAT-AEL range is 550 mg/Nm³.

Split view summary

EUROFER (supported by SK) proposes to include a new footnote in Table 9.7 when using other fuels stating that: "For existing plants, the higher end of the BAT-AEL range is 500 mg/Nm³ when high air preheating is applied and when the share of coke oven gas or of CO-rich gas from ferrochromium production is below 50% of energy input. If high air preheating is used in combination with a high share of coke oven gas or of CO-rich gas from ferrochromium production (> 50% of energy input), the higher end of the BAT-AEL range is 800 mg/Nm³".

The split view is accompanied by the following rationale

- The rationales provided by EUROFER in Section 2.2.8 are also valid for this split view but will not be repeated in detail again. Briefly, the rationales provided are related to:
  - the need to consider maximum concentrations when deriving BAT-AELs;
  - the effect of burner power on NO_x emissions;
  - the applicability of BAT 20 techniques (i), (j), and (k) in batch annealing and techniques (f), (g) and (h) in continuous annealing;
  - the relationship between limiting air preheating and increasing energy consumption.

Information on which the split view is based

- EUROFER proposed amendments to BAT 20 Tables 9.6 (HR), 9.7 (CR) and 9.9 (HDC) (uploaded in BATIS on 27/1/2021);
- EUROFER document entitled 'Summary of submitted input on air preheating and NO_x emissions and proposal for revised NO_X BAT-AELs (BAT 20)' (uploaded in BATIS on 13/1/2021);
- DE comments made on the revised FMP BREF BAT conclusions (October 2020 Version) (uploaded in BATIS on 7/11/2020);
- DE document entitled 'Sample calculation for NO_X reduction by limiting air preheating in batch annealing furnaces' (uploaded in BATIS on 7/11/2020);
- EUROFER comments made on the revised FMP BREF BAT conclusions (October 2020 Version) (uploaded in BATIS on 6/11/2020);
- EUROFER document entitled 'Surplus energy when limiting air preheating in batch annealing' (uploaded in BATIS on 6/11/2020);
- EUROFER comments made on the revised FMP BREF BAT conclusions (March 2020 Version) (uploaded in BATIS on 20/3/2020);
- EUROFER document entitled 'List of critical issues to address during FMP BREF Final Meeting' (uploaded in BATIS on 20/3/2020);
- EUROFER document entitled 'Additional comments on NO_X and air preheating in batch annealing' (uploaded in BATIS on 20/3/2020);

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- EUROFER document entitled 'input post 2nd FMP BREF data assessment workshop' (uploaded in BATIS on 17/12/2019);
- EUROFER comments to the key topics listed for the FMP 2nd Data Workshop (uploaded in BATIS on 26/11/2019);
- EUROFER document entitled 'List of actions undertaken from the FMP Data Workshop on 23-24/01/2019 to improve the data basis' (uploaded in BATIS on 6/2/2019);
- EUROFER comments on the Draft Graphs and the Data Tables submitted by the EIPPCB on 14/12/2018 (uploaded in BATIS on 21/1/2019);
- EUROFER inputs on new or amended BAT candidates (uploaded in BATIS on 4/9/2018);
- EUROFER document entitled 'Template for FMP KEI initial positions - EUROFER position' (uploaded in BATIS on 29/4/2016);
- EUROFER document entitled 'Update wish-list EUROFER' (uploaded in BATIS on 1/2/2016);
- FMP BREF (2001 version).

EIPPCB assessment
The documents and information referred to in the split view were available on time.

Validity of supporting rationale:
- The data situation related to feedstock heating in cold rolling when using other fuels may be summarised as follows:
    - In total, 8 EPs reported NO_X emission concentrations with other fuels for feedstock heating in cold rolling. Out of these, only two EPs reported the use of 100% COG with maximum NO_X emission concentrations of 308 mg/Nm³ and 945 mg/Nm³ (average NO_X emission concentrations of 143 mg/Nm³ and 612 mg/Nm³, respectively). The corresponding annealing temperatures associated with these emissions were 800 °C and 750 °C, respectively. Unfortunately, no information on the actual air preheating temperatures was reported for these data points, which does not allow the identification of the effects of air preheating.
    - There are no example plants in the data collection using less than 50% COG in the fuel mix that reported data for NO_X emissions.

EIPPCB conclusion
Taking these aspects into account, the EIPPCB considers that the split view representing the opinion of EUROFER supported by SK does not fulfil the conditions set out in Section 4.6.2.3.2 of Commission Implementing Decision 2012/119/EU. This split view will therefore not be reported in the "Concluding remarks and recommendations for future work" section of the BREF.

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2.2.10 Higher end of BAT-AEL range for channelled NO_X emissions to air from feedstock heating in hot dip coating when using 100% NG or fuels other than 100% NG and high air preheating (EUROFER, supported by SK)

Conclusion of the meeting

Slide 180 / BAT 20 / Table 9.9:

Table 9.9: BAT-associated emission level (BAT-AEL) for channelled NO_X emissions to air and indicative emission level for channelled CO emissions to air from feedstock heating in hot dip coating

Parameter	Unit	BAT-AEL (Daily average or average over the sampling period)	Indicative emission level (Daily average or average over the sampling period)
NO_X	mg/Nm³	100–300 (1) ~~250~~	No indicative level
CO	mg/Nm³	No BAT-AEL	10–100

(1) The higher end of the BAT-AEL range may be exceeded when using a high share of coke oven gas or of CO-rich gas from ferrochromium production (~~e.g.~~ > 50 % of energy input). In this case, the higher end of the BAT-AEL range is 550 mg/Nm³.

Split view summary

EUROFER (supported by SK) proposes to include a new footnote in Table 9.9 stating that: "For existing plants, when high air preheating is applied, the higher end of the BAT-AEL range is 500 mg/Nm³ when using 100% NG or other fuels including coke oven gas or CO-rich gas from ferrochromium production (< 50% of energy input). When high air preheating is applied and when a high share of coke oven gas or of CO-rich gas from ferrochromium production (> 50% of energy input) is used, the higher end of the BAT-AEL range is 800 mg/Nm³".

The split view is accompanied by the following rationale

- Information provided by one TWG member in October 2020 supports NO_X concentrations above the proposed higher end of the BAT-AEL range in the case of air preheating temperatures in the range of 400°C. In this case, NO_X concentrations range between 300 mg/Nm³ and 550 mg/Nm³. Additional supporting information has been provided by EUROFER to show the correlation between NO_X emission concentrations and the air preheating temperature in hot dip coating.
- There is only one BAT-AEL range for both natural gas and other fuels. Looking at the data from Figure 5.17 of the FMP BREF revised D1 showing that a few emission points breach the 500 mg/Nm³ mark, it would have been reasonable to introduce a specific footnote to account for higher NO_X levels (with or without COG > 50%).
- The rationales provided by EUROFER in the Section 2.2.3 related to the need to consider maximum NOx emission concentrations when deriving BAT-AELs, the effect of burner power on NO_x emissions, the applicability restrictions of some of the techniques identified as BAT for NOx emissions reduction, and the relationship between limiting air preheating and increasing energy consumption are also valid for this split view but will not be repeated again here.

Information on which the split view is based

- EUROFER proposed amendments to BAT 20 Tables 9.6 (HR), 9.7 (CR) and 9.9 (HDC) (uploaded in BATIS on 27/1/2021);
- EUROFER document entitled 'Summary of submitted input on air preheating and NO_x emissions and proposal for revised NO_X BAT-AELs (BAT 20)' (uploaded in BATIS on 13/1/2021);
- EUROFER comments made on the revised FMP BREF BAT conclusions (October 2020 Version) (uploaded in BATIS on 6/11/2020);

- EUROFER document entitled 'NO$_X$ versus energy efficiency' (uploaded in BATIS on 6/11/2020);
- EUROFER document showing NO$_X$ tests at ArcelorMittal (uploaded in BATIS on 08/10/2020);
- EUROFER comments made on the revised FMP BREF BAT conclusions (March 2020 Version) (uploaded in BATIS on 20/3/2020);
- EUROFER document entitled 'List of critical issues to address during FMP BREF Final Meeting' (uploaded in BATIS on 20/3/2020);
- EUROFER document entitled 'input post 2nd FMP BREF data assessment workshop' (uploaded in BATIS on 17/12/2019);
- EUROFER comments to the key topics listed for the FMP 2nd Data Workshop (uploaded in BATIS on 26/11/2019);
- EUROFER document entitled 'List of actions undertaken from the FMP Data Workshop on 23-24/01/2019 to improve the data basis' (uploaded in BATIS on 6/2/2019);
- EUROFER comments on the Draft Graphs and the Data Tables submitted by the EIPPCB on 14/12/2018 (uploaded in BATIS on 21/1/2019);
- EUROFER inputs on new or amended BAT candidates (uploaded in BATIS on 4/9/2018);
- EUROFER document entitled 'Template for FMP KEI initial positions - EUROFER position' (uploaded in BATIS on 29/4/2016);
- EUROFER document entitled 'Update wish-list EUROFER' (uploaded in BATIS on 1/2/2016);
- FMP BREF (2001 version).

EIPPCB assessment
The documents and information referred to in the split view were available on time.

Validity of supporting rationale:

- The data situation may be summarised as follows:
  - <u>Feedstock heating in hot dip coating for plants using 100% natural gas</u>:
    There are a number of EPs in the data collection operating with 100% NG that reported NO$_X$ emission concentrations above the higher end of the BAT-AEL range (i.e. > 300 mg/Nm^3) and operating at high air preheating temperatures (> 400 °C).

  - <u>Feedstock heating in hot dip coating for plants using other fuels</u>:
    Only 3 EPs reported the use of other fuels in the data collection, namely:
    - 129 HDC-1 (using 100% BOF): NO$_X$ emission concentrations ranged from 145 mg/Nm^3 to 238 mg/Nm^3, with a mean value (N = 8) of 172 mg/Nm^3;
    - 37 HDC-3 (using 100% COG): NO$_X$ emission concentrations ranged from 203 mg/Nm^3 to 684 mg/Nm^3, with a mean value (N = 10) of 452 mg/Nm^3;
    - 179 HDC-1 (using 100% COG): NO$_X$ emission concentrations ranged from 297 mg/Nm^3 to 1 051 mg/Nm^3, with a mean value (N = 4) of 632 mg/Nm^3.

    Only EPs 37HDC-3 and 179 HDC-1 reported using air preheating, with temperatures of 400 °C and 450 °C, respectively.
    There are no example plants in the data collection that reported NO$_X$ emissions data when using less than 50% COG in the fuel mix.

EIPPCB conclusion
Taking these aspects into account, the EIPPCB considers the following:

a. The parts of the split view representing the opinion of EUROFER supported by SK related to the introduction of a new footnote to increase the higher end of the BAT-AEL range for NO$_X$ emissions in hot dip coating feedstock heating, with high air preheating, when using 100% NG or a high share of coke oven gas or of CO-rich gas from ferrochromium production (> 50% of energy input), fulfil the conditions set out in Section 4.6.2.3.2 of Commission Implementing Decision 2012/119/EU. These parts of the split view will therefore be reported in the "Concluding remarks and recommendations for future work" chapter of the BREF.

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b. The other parts of the split view representing the opinion of EUROFER supported by SK related to the introduction of a new footnote to increase the higher end of the BAT-AEL range for NO_X emissions in hot dip coating feedstock heating, with high air preheating, when using other fuels including coke oven gas or CO-rich gas from ferrochromium production (< 50% of energy input), do not fulfil the conditions set out in Section 4.6.2.3.2 of Commission Implementing Decision 2012/119/EU. These parts of the split view will therefore not be reported in the "Concluding remarks and recommendations for future work" chapter of the BREF.

A possible formulation of this split view could be:

BAT conclusion	Dissenting view	Expressed by	Alternative proposed level (if any)
BAT 20 / Table 9.9	*Amend footnote (¹) as follows: "When high air preheating is applied, the higher end of the BAT-AEL range is 500 mg/Nm³ when using 100% NG. When high air preheating is applied, the higher end of the BAT-AEL range is 800 mg/Nm³ when a high share of coke oven gas or of CO-rich gas from ferrochromium production (> 50% of energy input) is used."*	*EUROFER supported by SK*	*500 mg/Nm³ (with high air preheating and 100% NG)* *800 mg/Nm³ (with high air preheating and a share of coke oven gas or of CO-rich gas from ferrochromium production > 50% of energy input)*

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2.2.11 BAT-AEL range and mass flow threshold for channelled NOx emissions to air from heating the galvanising kettle in BG (PT)

Conclusion of the meeting

Slide 183 / BAT 20 / Table 9.10:

Table 9.10: BAT-associated emission level (BAT-AEL) for channelled NO_X emissions to air and indicative emission level for channelled CO emissions to air from heating the galvanising kettle in batch galvanising~~and from feedstock drying~~

Parameter	Unit	BAT-AEL (Daily average or average over the sampling period)	Indicative emission level (Daily average or average over the sampling period)
NO_X	mg/Nm³	70–~~150~~300 ~~(¹)~~	No indicative level
CO	mg/Nm³	No BAT-AEL	10–100
~~(¹) The BAT-AEL does not apply when the NO_X mass flow is below 500 g/h.~~			

Split view summary

PT proposes to reinstate footnote (¹) in Table 9.10 specifying that: "The BAT-AEL does not apply when the NO_X mass flow is below 500 g/h" and also to maintain (or not) the initial BAT-AEL range that was proposed for NO_X emissions from 70 mg/Nm³ to 150 mg/Nm³.

An alternative proposal could be to consider the introduction of a threshold for the O_2 content in the waste gas above which it is not possible to apply the O_2 content correction formula used to correct emission concentration values to 3% O_2 (e.g. O_2 (measured) > 16 %).

The split view is accompanied by the following rationale

- Looking at NO_X data from heating the galvanising kettle, in Figure 6.10, the O_2 measured in the gaseous emissions for the Portuguese plants (224; 226; 227 and 228) is higher than 15% and in some cases close to 21%. The data collection shows that such high O_2 content occurs also at other BG plants in Europe.
- The Portuguese plants have low NO_X mass flow emissions, lower than 500 g/h. The oxygen content issue was not relevant when footnote (¹) was present because all the Portuguese plants emit were below the threshold.
- NO_X emissions data seems to indicate that there is no correlation between a high content of O_2 and low NO_X mass flow emissions.
- Applying the formula for O_2 correction at the 3% O_2 reference level, in cases where high O_2 content is measured, leads to very high NO_X emission concentrations that penalise the operator.
- In the discussion at the Final TWG Meeting on this issue, a higher value for the higher end of the BAT-AEL range was agreed while footnote (¹) was deleted.
- Without correction to the 3% O_2 level, the NO_X emission concentrations in the Portuguese plants are lower than the BAT-AEL initially proposed before the Final Meeting (i.e. 70-150 mg/Nm³).
- However, when applying the formula for the O_2 correction, when the O_2 measured is high and the O_2 reference used is 3% , the recalculated NO_X emission concentrations become very high and penalise the operator (e.g. a value of 31 mg/Nm³ at 16.2% O_2, when corrected to 3% O_2 leads to an emission value of 116 mg/Nm³).
- Only two Portuguese plants presented higher values of NO_X when they were corrected to 3% O_2: PT224 and PT226-2; however, the measured values (without O_2 correction) were all substantially lower than the values presented in Figure 6.10. The higher values result from applying the formula to correct the O_2 content, because the O_2 measured is high.
- Measurements for PT224 show high O_2 content in the gaseous emissions (19.5% and 20.9%). In this case, one may consider that the values are higher than the accepted level for using the O_2 correction formula. Measurements for PT226 also show high O_2 content (16.2% and 18.1%). At this plant, the permit initially considered using an O_2 correction at 3%, but technically it was reassessed and concluded not to proceed with such a correction to assess compliance but to use an ELV based on the concentration as measured. In these two cases,

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because of the high O_2 content, the ELVs in the permits do not consider a correction for the O_2 content.

- Since the real problem identified refers to the application of the correction at the 3% O_2 reference level, an alternative could be to consider a threshold for the O_2 content above which it is not possible to apply the O_2 content correction formula (when the typical measured O_2 content is high, e.g. > 16 %).
- Information was gathered about calculation of the emission concentration at the reference oxygen level of 3% dry vol-%, by normalising on the basis of the carbon dioxide generated by the combustion (as proposed in the BAT conclusions). It was concluded that this formula can only be applied when the O_2 measured is below 3%.
- The formula used is the following : $E_R = (O_R\text{-}O_M/ CO_{2M}) \times E_M$ where O_R is the percent of the O_2 reference, O_M is the percent of O_2 measured, CO_{2M} is the carbon dioxide concentration measured in vol-%, E_M is the emission concentration measured and E_R is the emission concentration for the O_2 reference. If carbon dioxide is present in the gaseous emissions, it is necessary to adjust the O_2 concentration using the equation $\%O_{2M}(adj) = \%\ O_2 - \%\ CO$ vol% (dry) and to adjust the CO_2 concentration using the equation $\%CO_{2M}\ (adj) = \%CO_2 + \%CO$ vol% (dry). Therefore, this formula can only be considered when O_M is below 3%.
- In the Final Meeting, it was assumed that there were difficulties in the assessment of these data and there was a need to collect more information on this issue in the next review process. Therefore, it was decided to include in the 'Concluding remarks and recommendations for future work' section of the BREF that more information should be collected during the next BREF review on NO_X emission data for the batch galvanising sector and especially for plants equipped with canopy heaters (e g. high-temperature galvanising); therefore, it is prudent to consider in the final FMP BREF an approach that does not penalise the operators based on the O_2 content in their gaseous emissions.

Information on which the split view is based

- Figure 6.10 'NO_X and CO emissions from heating the galvanising kettle (at 3% oxygen) (uploaded in BATIS on 04/12/2020);
- PT comments made on the revised FMP BREF BAT conclusions (March 2020 Version) (uploaded in BATIS on 13/03/2020)
- Questionnaires for batch galvanising Plants PT224 and PT226-2 (uploaded in BATIS) and their permits.

EIPPCB assessment

Some documents and information referred to in the split view were available on time (i.e. questionnaires for Plants 224, 226, 227, 228 and Figure 6.10). However, no comments were received from PT on the FMP BAT conclusions (March 2020 Version), and on the subsequent versions of the BAT conclusions (e.g. October 2020 version), concerning Table 9.10 and the NO_X emissions of plants PT224 and PT226. The only comments received (PT3 and PT4) on the FMP BAT conclusions (March 2020 Version) do not relate to BG.

Validity of supporting rationale:

- No technical justification is given to explain why the mass flow threshold indicated in footnote ([1]) should be reinstated. The rationale focuses only on the NO_X emission results of several Portuguese emission points.
- According to the data reported in the questionnaires, the following ELVs in the permit conditions apply for plants:
  - PT 224: ELV = 500 mg/Nm^3, dry gas, corrected to 8% O_2;
  - PT 226: ELV = 500 mg/Nm^3, dry gas, corrected to 3% O_2;
  - PT 227: ELV = 500 mg/Nm^3, dry gas, as measured;
  - PT 228: ELV = 500 mg/Nm^3, dry gas, as measured.

  This is not fully in agreement with the information provided in the rationale above.
- PT 226 (Line 2) reported two measurements. The first measurement was carried out in 2016, with a measured NO_X emission concentration of 31 mg/Nm^3 (corresponding to an O_2 content of 16.2%), equating to 116 mg/Nm^3 (after correction to 3% O_2). This measurement complies with the BAT-AEL range. The second measurement was realised in 2013, with a measured

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NOx emission concentration of 160 mg/Nm³ (corresponding to an O_2 content of 18.1%), equating to 994 mg/Nm³ (after correction to 3% O_2). The second measurement was incomplete since its duration was only 20 minutes (30 minutes are required). It was also associated with an extremely high CO concentration (574 mg/Nm³), indicating a problem with the combustion process during the measurement. Based on this, the results of the second NO_X emission measurement should be discarded.

- PT 224 reported two measurements. Both measurements were carried out in 2016 and resulted in the same measured NO_X emission concentration of < 4.1 mg/Nm³ (corresponding to measured O_2 contents of 19.5% and 20.9%). This resulted in a NOx emission concentration of 49 mg/Nm³ (after correction to 3% O_2 / 19.5%), in compliance with the BAT-AEL range, and an emission concentration of 738 mg/Nm³ (after correction to 3% O_2 / 20.9%). Of course, the second correction does not make sense considering the extremely high oxygen content. Also, such a high O_2 level in the waste gas is questionable.
- A number of other batch galvanising plants in the data collection reported a high oxygen content in the waste gas (e.g. 226-1, 228, 227, 198, 85) and NO_X emission concentrations, corrected to 3% O_2, in compliance with the BAT-AEL range (i.e. 70 mg/Nm³ to 300 mg/Nm³).
- The example calculation described in the rationale aiming at normalising the NO_X emissions on the basis of the carbon dioxide in the waste gas is unclear and does not seem to correspond to the example provided in Annex 11.5 to the FMP BREF revised D1 (July 2020 version). Furthermore, no clear examples are provided, including data for the relevant CO_2 emission concentrations used for normalisation, in support of the conclusions made.

EIPPCB conclusion

Taking these aspects into account, the EIPPCB considers that the split view representing the opinion of PT does not fulfil the conditions set out in Section 4.6.2.3.2 of Commission Implementing Decision 2012/119/EU. This split view will therefore not be reported in the "Concluding remarks and recommendations for future work" section of the BREF.

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2.3 Residues

2.3.1 Techniques to reduce the quantity of waste sent for disposal (EEB)

Conclusion of the meeting

Slide 250 / BAT 31:

BAT 31. In order to ~~increase material efficiency and to~~ reduce the quantity of waste sent for disposal, BAT is to avoid the disposal of metals, metal oxides and oily sludge and hydroxide sludge ~~by~~ using technique (a) and an appropriate combination of ~~all of the~~ techniques (b) to (h) given below.

Technique		**Description**	**Applicability**
a	Residues management plan	A residues management plan is part of the EMS (see BAT 1) and is a set of measures aiming to 1) minimise the generation of residues, 2) optimise the reuse, recycling and/or recovery of residues, and 3) ensure the proper disposal of waste. The residues management plan may be integrated in the overall residues management plan of a larger installation (e.g. for iron and steel production).	The level of detail and the degree of formalisation of the residues management plan will generally be related to the nature, scale and complexity of the installation
b	Pretreatment of oily mill scale ~~with~~for further use ~~recycling~~	This includes techniques such as: - briquetting or pelletising; - reducing the oil content of oily mill scale, e.g. by thermal treatment, washing, flotation.	Generally applicable.
c	~~Recycling~~ Use of mill scale	~~Scale is collected and used in a sinter plant (in the case of scale with a low oil content) or in iron- and steel-making furnaces (in the case of scale with a high oil content).~~ Mill scale is collected and used on site or off site~~recycled~~, e.g. ~~to~~ in iron and steel production or in cement production.	Generally applicable.
d	~~Recycling~~ Use of metallic scrap	Metallic scrap from mechanical processes (e.g. from trimming and finishing) is used ~~recycled to~~ in iron and steel production. This may take place on site or off site.	Generally applicable.
e	Recycling of metal and metal oxides from dry waste gas cleaning	The coarse fraction of metal and metal oxides originating from dry cleaning (e.g. fabric filters) of waste gases from mechanical processes (e.g. scarfing or grinding) ~~are~~ is selectively isolated using mechanical techniques (e.g. sieves) or magnetic techniques and recycled, e.g. to iron and steel production. This may take place on site or off site.	Generally applicable.
f	Use of oily sludge	Residual oily sludge, e.g. from degreasing, is dewatered to recover the oil contained therein for material or energy recovery ~~further use (e.g. as fuel). Alternatively, i~~If the water content is low, the sludge can be directly used ~~as fuel~~. This may take place on site or off site.	Generally applicable.
g	Thermal treatment of hydroxide sludge from the recovery of mixed acid	Sludge generated from the recovery of mixed acid is thermally treated in order to produce a material rich in calcium fluoride that can be used in argon oxygen decarburisation converters.	~~Generally applicable.~~ Applicability may be restricted by a lack of space.
h	Recovery and reuse of shot blast media	Where mechanical descaling is carried out by shot blasting, the shot blast media are separated from the scale and reused.	Generally applicable.

Split view summary
EEB proposes to amend the BAT statement and the description and applicability restriction of technique (f) as follows:

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- Proposal A (proposed amendments in bold):

Keep the previous text in the BAT statement referring to **"all of the techniques given below"** and modify technique (f) as indicated in proposal B. In addition, consider amending the BAT statement in order to include the same order as in the waste hierarchy and make clear that disposal/energy recovery are the last options (e.g. by adding in the BAT statement "***in accordance with the EU waste hierarchy***")

- Proposal B (proposed amendments in bold):

Technique description: "Residual oily sludge, e.g. from degreasing, is dewatered to recover **exclusively the oil contained therein for further use, in priority for other uses than fuel (e.g. reuse of works oil). If the water content is low and its properties are free from metal or halogen contaminants, the recovered oil fraction can be used as fuel.**"

An additional sentence may be added: **"Where the recovered oily sludge is used as a fuel, the emissions shall not be higher than those resulting from the application of BAT conclusions for the incineration of waste."**

Applicability restriction of technique (f): "generally applicable **if the residue does not contain halogenated compounds and metal particles**".

- Proposal C (preferred last option to proposal B):

Delete technique (f).

The split view is accompanied by the following rationale

- All the techniques listed are commonly applicable and thus EEB supported the initial EIPPCB proposal to refer to "all of the techniques", noting that in all cases the BAT conclusions are not exhaustive and/or subject to dedicated applicability restrictions (e.g. techniques (a) and (g)).
- Regarding technique (f), oily sludge should not be directly used as "fuel" because it might be heavily contaminated. It is used as a "waste fuel". The BAT conclusions should prevent the incentivisation of the use of contaminated waste as input fuel. It should clearly require that the material be decontaminated first.
- Building on similar comments expressed by other stakeholders (notably SE12 / SE14 and AT39 submitted after D1), the current text is not in line with the EU waste hierarchy requirements even if EEB acknowledges that some wording improvements have been made to that effect in order to capture the material recovery aspect and not to focus on energy recovery (fuel use) only.
- The main point of contention from the EEB perspective is that the current description does not prevent disposal of sludge containing halogens and metals that are not captured within the current BAT conclusion proposals - hence may be emitted by FMP or related iron and steel activities. Burning oily sludge is a relevant problem in the iron and steel / ferrous metals processing steel industry. The burning of oily sludge residues in blast furnaces / on-site combustion plants could be a reason why certain ferrous metal sites still rank as top PCCD/F emitter sites in certain countries (e.g. Arcelor Mittal Dunkerque, responsible for about 50% of the total PCDD/F industrial source emissions in France). It should therefore not be BAT to "directly" use this as a fuel (in fact waste disposal) without first making sure the oily sludge is free from metals and halogenated (organic) compounds, giving rise to other pollution.
- There are techniques that aim to separate contaminants from the oil fraction and different to fuel use which should be preferred if the aim of the BAT is to prevent and reduce disposal.
- It was acknowledged at the Final Meeting that data availability on the type and extent of contamination of the oily sludge was rather low; however, EGGA indicated that the oily sludge treatment is generally outsourced since it is highly contaminated.
- In order to take a precautionary approach, EEB suggested full deletion of technique (f) (Proposal C), which was supported by AT and DE whilst IT supported the revised EIPPCB proposal.
- The EEB alternative text proposal would ensure that oily sludges that are classified as "hazardous" wastes are not burned (co-incinerated), actually incentivising 'illegal' hazardous waste disposal.

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Information on which the split view is based

- Comment EEB22 submitted after D1;
- Comment EEB12 submitted after the revised BAT conclusion version (October 2020).

EIPPCB assessment

The documents and information referred to in the split view were available on time.

Validity of supporting rationale:

- The applicability of technique (g) was modified at the Final TWG Meeting, and consequently the BAT statement was modified by replacing 'all of the techniques' with 'an appropriate combination of techniques (b) to (h)'. This change reflects the fact that not all techniques are now applicable. Reinstating in the BAT statement the reference to 'all of the techniques' as suggested in EEB's Proposal A does not seem to be a viable option.
- Oily sludge generated in cold rolling and hot dip coating from degreasing operations (e.g. before annealing) can be directly used in the blast furnaces as reductant (see FMP BREF pages 243 and 288). This technique enables the reduction of the coke consumption rate in the blast furnace, increasing its overall energy efficiency. The blast furnaces are not a significant source of PCDD/Fs in iron and steel integrated steelworks. This is clearly explained in Section 3.2.2.1.2.9 of the IS BREF, which describes in detail the formation of PCDD/Fs in iron ore sintering, the process considered as the main source of PCDD/Fs in this sector. Oily sludge generated in the FMP processes are not used at iron ore sintering plants. For this specific case, deleting technique (f) as suggested in EEB's Proposal C does not seem to be fully justified. It would prevent the reuse of oily sludge in blast furnaces and the associated benefits in terms of circular economy and energy efficiency.
- On the other hand, oily sludge generated in batch galvanising from degreasing operations is either removed from the site by a specialised contractor for the recovery of the oil contained therein or used as fuel if the water content is low. It is specified in the 2001 FMP BREF that the use as fuel option is only possible depending on the contaminant load and the calorific value. Based on discussions at the Final TWG Meeting, there is some uncertainty regarding the nature and quantities of the contaminants actually present in oily sludge, in particular from batch galvanising. This resulted in the decision added to the conclusion slides of the Final Meeting (Slide 253) to include (in the 'Concluding remarks and recommendations for future work' section of the BREF) that further information on possible uses of oily sludge as well as on the characteristics of oily sludge in terms of contaminants (e.g. halogens, metals) should be collected during the next BREF review. Considering the level of uncertainty on the contaminants present in the oily sludge in batch galvanising, a modification of the description of technique (f), as proposed by EEB (Proposal B), indicating that the use of oily sludge as fuel is only possible if the material is free from metal or halogen contaminants could be justified. In this case, it does not seem necessary to repeat the same argument in the applicability of technique (f).

EIPPCB conclusion

Taking these aspects into account, the EIPPCB considers that the split view representing the opinion of EEB (Proposal B) fulfils the conditions set out in Section 4.6.2.3.2 of Commission Implementing Decision 2012/119/EU. This split view will therefore be reported in the "Concluding remarks and recommendations for future work" chapter of the BREF.

A possible formulation of this split view could be:

BAT conclusion	Dissenting view	Expressed by	Alternative proposed level (if any)

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BAT 31 (f)	*Amend the description of technique (f) as follows: "Residual oily sludge, e.g. from degreasing, is dewatered to recover exclusively the oil contained therein for further use, preferably for other uses than fuel (e.g. reuse of works oil). If the water content is low and its properties are free of metal or halogen contaminants, the recovered oil fraction can be used as fuel."*	*EEB*	*NA*

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3 BAT CONCLUSIONS FOR BATCH GALVANISING

3.1 Emissions to air

3.1.1 Techniques to reduce emissions to air of HCl from pickling and stripping in batch galvanising (EGGA, ES supported by IT and PT)

Conclusion of the meeting
Slide 318, BAT 22bis:

BAT 22 bis. In order to reduce emissions of HCl to air from pickling and stripping in batch galvanising, BAT is to control the operating parameters (i.e. temperature and acid concentration in the bath) and to use the techniques given below with the following order of priority:

- **technique (a) in combination with technique (c);**
- **technique (b) in combination with technique (c);**
- **technique (d) in combination with technique (b);**
- **technique (d).**

Technique (d) is BAT only for existing plants and provided that it ensures at least an equivalent level of environmental protection compared to using technique (c) in combination with techniques (a) or (b).

Technique		**Description**	**Applicability**
Collection of emissions			
a	Enclosed pretreatment section with extraction	The entire pretreatment section (e.g. degreasing, pickling, fluxing) is encapsulated and the fumes are extracted from the enclosure.	Only applicable to new plants and major plant upgrades
b	Extraction by lateral hood or lip extraction	Acid fumes from the pickling tanks are extracted using lateral hoods or lip extraction at the edge of the pickling tanks. This may also include emissions from degreasing tanks.	Applicability in existing plants may be restricted by a lack of space. ~~Generally applicable.~~
Waste gas treatment			
c	Wet scrubbing followed by a demister	See Section 9.7.2.	Generally applicable
Reduction of generation of emissions			
d	Restricted operating range ~~in the case of batch pickling using~~ for hydrochloric acid open pickling baths	~~The pickling acid temperature and HCl concentration in the pickling bath(s) controlled so that both of~~Hydrochloric acid baths are strictly operated within the temperature and HCl concentration range determined by the following conditions ~~are met~~: a) 4 °C < T < (80 – 4 w) °C; b) 2 wt-% < w < (20 – T/4) wt-%, where T is the pickling acid temperature expressed in °C and w the HCl concentration expressed in wt-%. The bath temperature ~~and HCl concentration are~~ is measured at least once every day. The HCl concentration in the bath is measured every time fresh acid is replenished and in any case at least once every week. To limit evaporation, movement of air across the bath surfaces (e.g. due to ventilation) is minimised.	Generally applicable

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Split view summary

EGGA split view:

EGGA proposes to delete '*with the following order of priority*' in the first paragraph of the BAT statement. In addition, EGGA proposes to delete the final paragraph of the BAT statement: '*Technique (d) is BAT only for existing plants and provided that it ensures at least an equivalent level of environmental protection compared to using technique (c) in combination with techniques (a) or (b)*'.

ES split view:

ES proposes two options summarised below:

- Option 1:

  Option 1 is identical to the split view raised by EGGA (see above).

- Option 2:

  In addition to Option 1, ES proposes a way forward to solve the implementation problem of BAT 22 bis poses related to the lack of measuring EN standards for the emissions generated in technique (d). The proposal consists in adding a new paragraph at the end of the BAT statement as follows:

  - Given the lack of EN standards or other methods to measure unchannelled HCl emissions (when using technique (d)) to derive BAT-AELs, the Competent Authorities could alternatively use as an implementation guidance the following criterion:

    Technique (d) is considered BAT if it complies with the indicative occupational exposure limit values for HCl specified in Commission Directive 2000/39/EC of 8 June 2000.

IT split view:

IT proposes to substitute in the final paragraph of the BAT statement the word "and" with the word "or" as follows: "technique (d) is BAT only for existing plants or provided it ensures at least an equivalent level of environmental protection compared to the use of technique (c) in combination with techniques (a) or (b)". Nevertheless, IT considers the ES split view (in particular Option 1) to be a very good solution and proposes to withdraw its own split view if the ES split view Option 1 is reported.

PT split view:

The PT split view is identical to the IT proposal presented above. PT indicates that it also supports the ES split view.

The split view is accompanied by the following rationale

Rationale submitted by EGGA:

- Throughout the development of the BAT conclusions, many TWG members made clear that technique (d), as opposed to techniques (a) or (b) plus (c), are associated with entirely different plant configuration. The choice of plant configuration is driven by factors other than reduction of HCl emissions to air. The notion of an assessment of equivalence with technique (a) plus emission abatement was rejected by many TWG members, including EGGA. There is no reliable and meaningful method to make a direct assessment of equivalence between technique (d) and techniques (a) or (b) plus (c). The concept is both impractical and unnecessary.
- Technique (a) in combination with technique (c) may be applied by plants with more intensive methods of production, e.g. using a lower number of tanks and/or applying the techniques of activated pickling that may require heating of pickling acid in northern European locations. Technique (a) also has advantages in reduction of corrosion of overhead cranes and building fabric and is often a preferred plant configuration where production volumes justify this. This method of production results in channelled HCl emissions and therefore the need for combination with technique (c). Occupational exposures to HCl are controlled by physical separation of workers from the elevated concentrations within the enclosure.
- Technique (d) is operated under different production conditions and on the principle of prevention of emissions at source through careful control of the operating temperature and acid concentration. The EIPPCB gave a robust explanation of the principles of technique (d) and its effectiveness in the 2nd Data Workshop in response to suggestions from some TWG members that the technique may not be effective in controlling emissions. As is noted by the EIPPCB assessment in the BP of February 2020 (page 108, 4th bullet point), technique (d)

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"does not require major equipment to be installed, no energy consumption for air extraction and abatement, no use of water/scrubbing media, while still limiting emissions by limiting the acid temperature and the HCl concentration". These cross-media effects were not properly considered in the decisions of the Final TWG Meeting.

- It is also notable that plants operating technique (d) alone were, de facto, not within the scope of the data collection and are not represented in Figure 6.13. All plants will, as is recognised in the BAT statement for BAT 22 bis, operate control of temperature and concentration of the pickling acid. The effectiveness of technique (d) in controlling occupational exposures was considered of importance and additional supporting data were collected within the TWG to confirm the effectiveness of technique (d) in maintaining emissions at levels. The TWG also noted (in particular at the 2nd Data Workshop) that some plants controlling temperature and acid concentration within the parameters of technique (d) and without abatement, e.g., Plant 192, illustrated the very low level of emission associated with technique (d).

Rationale submitted by ES:

- Technique (d) is a preventive technique where HCl emissions are prevented by controlling the temperature and concentration of the HCl bath within certain limits.
- It has been recognised in BAT 4 that no EN standard is available for measuring HCl emissions from pickling and stripping with hydrochloric acid in open pickling baths and no other way to implement the required measurements has been defined in the BAT conclusions or in the BREF.

Option 1 rationale:

- The lower priority given to technique (d) in relation to the other techniques in BAT 22 bis does not take sufficient account of the following fundamental aspects:
  - The need to be guided by the principle of pollution prevention (i.e. Article 191 of the Treaty on the Functioning of the European Union, Definition 10 of "best available techniques" in the IED and point 2.3.7.1 of the BREF Guidance). According to point 2.3.7.1 of the BREF Guidance: "This pool of possible techniques will cover both pollution prevention and control measures, recognising that emission prevention, where practicable, is preferred over emissions reduction". Technique (d) is a preventive technique and as such should be considered as the preferred option over (or at least equal to) corrective techniques and not the other way around, as it is now the case in BAT 22 bis.
- According to point 2.3.7.1 of the BREF Guidance on techniques to consider in the determination of BAT: "The techniques described will cover those which reduce the use of raw materials, water and energy, as well as measures used to prevent or to limit the environmental consequences of accidents and incidents and site remediation measures. They will also cover measures taken to prevent or reduce pollution under other than normal operating conditions (such as start-up and shutdown operations, leaks, malfunctions, momentary stoppages and the definitive cessation of operations)." This is also taken into account in the IED Annex III criteria for determining BAT, and in particular in points 9 and 11:
  - Point 9: *the consumption of raw materials used in the process and energy efficiency*: In technique (d), less HCl is lost by evaporation than in the other techniques because of the lower operating temperature and concentrations in the HCl bath. Also, in technique (d), less energy is needed to heat the bath and no energy is needed to operate extraction means as opposed to techniques (a) or (b) in combination with technique (c).
  - Point 11: *the need to prevent accidents:* When applying techniques (a), (b) and (c), there is a risk of accidental releases to the atmosphere of HCl fumes because of potential leaks in the enclosure of technique (a), malfunctioning or leaks from the hoods or lips of technique (b), or a malfunction of the wet scrubbers. When using technique (d), a preventive technique, there is no potential for accidental releases of HCl fumes.

To take into account those aspects, the best solution would be to delete the references to an order of priority among the different techniques in BAT 22 bis as proposed in Option 1.

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<u>Option 2 rationale:</u>

The way to verify that technique (d) ensures at least an equivalent level of environmental protection compared to using technique (c) in combination to techniques (a) or (b) is not explained in the BREF.

This may lead to significant implementation issues. However, it is recognised that there is a need to ascertain that technique (d) achieves a sufficient prevention level as to ensure a sufficient protection level of the environment on its own, not by comparison with corrective techniques.

- *Use of indicative occupational exposure limit values*

If a person is safe next to the HCl emission source generated by the pickling bath, then this could be considered an indication that further away from the source those emissions are not going to pose a threat to the environment. Methods to measure the occupational exposure of workers to HCl are already developed and used in the batch galvanising industry. Indicative occupational exposure limit values for HCl are established in Directive 2000/39/EC and in the corresponding national legislation. Documents with examples of occupational exposure levels to HCl from the pickling baths in the batch galvanising industry have been submitted in BATIS under the title "SE reports on HCl from BG pickling in work environment monitoring". Integrating the use of those measurements as part of the permits would be in the spirit of integration of the IED and would avoid undue burdens to the installations. Hence, Option 2 consists of deleting the priority references in the BAT 22 bis statement and in introducing a new criterion based on occupational exposure level values to ensure that the technique achieves a desired environmental protection level.

<u>Rationale submitted by IT and PT</u>:

- The formulation of BAT 22 bis leads to the absence of a reference BAT when (in existing plants) the applicability constraints of techniques (a) and (b) occur and then "the use of technique (c) in combination with techniques (a) or (b)" is not an option.
- The second part of the sentence requires the competent authorities to guarantee the achievement by a prevention technique (d) of an equivalent or better level of protection compared to the abatement techniques (c) and (a) or (b). In other words, the competent authority has the duty to conduct on a case-by-case basis a comparison that the TWG was unable to make at a general level.
- There are doubts about the status of reference BAT for technique (d) and regarding the proposed priority (any technique which can grant an equivalent or better level of environmental protection compared to a reference BAT is allowed, according to the IED, even if it is not mentioned in the BREF), It is not clear why competent authorities should challenge "a priori" the use of a technique if the FMP TWG recognises that it can potentially guarantee an equivalent or better level of protection.
- The collected information does not allow a solid comparison between technique (d) and the combination of techniques (c) and (a) or (b). The problem is recognised by the TWG, but the proposed solution is not adequate, as it penalises technique (d). In particular, the data collected do not show that the combination of techniques (c) and (b) always ensures a better level of environmental protection than technique (d).

The following points are also highlighted in relation to the difficulties linked to the realisation of meaningful emission measurements with technique (d):

- The assessment of compliance with the BAT-AEL using measurements of emissions that are not channelled via a stack may not assure the representativeness of the sample.
- The correct procedures and the criteria to be considered (to assure representativeness and correctness for sampling) are not defined in the BREF and there are no EN standards available to ensure the provision of data of an equivalent scientific quality.
- This requirement will have to be evaluated and established by the Competent Authorities in each Member State but there is a lack of information regarding the type of measurements to be carried out. In addition, different criteria and/or different considerations may be applied by different plants or MS. In this case, the data collected in the next BREF review will not be comparable.

- For the next BREF review, it is considered important that detailed information about the procedures applied by the plants to collect the sample should be collected and any associated information about the representativeness of the values measured.

Information on which the split view is based

Information supporting EGGA split view:

- BP for the Final TWG Meeting (published in February 2020) – EIPPCB assessment for Technique (d) [then named technique (a)];
- EIPPCB site visit to an Austrian plant (Zinkpower) in November 2017 – details operational conditions related to enclosed pre-treatment and abatement;
- Reports submitted by Sweden on HCl occupational exposure monitoring in advance of the Final TWG for Plants 233, 233 and 236 (December 2019);
- Reports submitted by the UK on HCl occupational exposure monitoring in advance of the Final TWG for Plants 251, 252, 254, 255, 257 and 258 (December 2019);
- BREF Guidance – for principle of prevention of emissions at source.

Information supporting ES split view:

- Consolidated version of the Treaty on the Functioning of the European Union (TFEU - OJ C 115, 9.5.2008) (art. 191.2);
- Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control);
- BREF Guidance: Commission Implementing Decision 2012/119/EU of 10 February 2012.

Information supporting IT and PT split view:

- Questionnaires for installations IT183, IT187, IT188; IT289 showing a high level of environmental protection using technique (d);
- Questionnaires for IT189 and IT192 and the additional information shared on the 16th of December 2019 showing a high level of environmental protection using technique (d) and (c).

EIPPCB assessment

The documents and information referred to in the split view were available on time.

Validity of supporting rationale:

- Differences between batch galvanising plants equipped with an enclosed pretreatment section (technique (a)) and batch galvanising plants operating open baths under controlled temperature and acid concentrations (technique (d)) were discussed during the 2nd Data Workshop. In particular, the specificities of plants equipped with an enclosed pretreatment section were highlighted, such as higher production throughput and pickling at higher temperatures resulting in the need for collection and abatement measures for HCl. On the other hand, batch galvanising plants operating open HCl pickling baths under close control of process parameters (temperature, concentration) that are within the range specified in the VDI standard (VDI 2579)[1] are not usually equipped with collection and abatement.
- Plants operating open HCl baths without collection and abatement did not report emission concentration values for HCl. The HCl emissions reported for Plant 192 are in fact associated with fluxing operations rather than pickling so they cannot be used as a reference.
- Information was submitted by the UK summarising the results from an occupational exposure survey at a batch galvanising plant operating open HCl pickling baths within the range specified in the VDI standard. At this plant, the acid concentration ranged between 10% and 14% and pickling took place at ambient temperature. The measured HCl concentrations in ambient air did not exceed 4.5 mg/Nm³.
- Information was also submitted by SE summarising the results from occupational exposure surveys at three batch galvanising plants operating open HCl pickling baths within the range

[1] Verein Deutscher Ingenieure, - Richtlinie 2579 Emission Control Hot-Dip Zinc Galvanising Plants", 2008.

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specified in the VDI standard. At these plants, the measured acid concentrations in ambient air were < 1.3 mg/Nm^3, well below the Swedish national workplace exposure limits for HCl (i.e. 3 mg/Nm^3).

- Commission Directive 2000/39/EC of 8 June 2000 establishes a list of indicative occupational exposure limit values in implementation of Council Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work. For HCl, an indicative occupational exposure value of 8 mg/Nm^3 (measured or calculated in relation to a reference period of 8-hours time-weighted average) is specified.
- There are no EN standards currently available for measuring unchannelled HCl emissions, which can be used to characterise emissions from open pickling baths in batch galvanising. However, the use of the occupational exposure limit values for HCl established according to Commission Directive 2000/39/EC of 8 June 2000 for demonstrating that an equivalent level of environmental protection can be achieved with technique (d) could be considered.

EIPPCB conclusion
Taking these aspects into account, the EIPPCB considers that the split views representing the opinion of EGGA and ES (Options 1 and 2, also supported by IT and PT) fulfil the conditions set out in Section 4.6.2.3.2 of Commission Implementing Decision 2012/119/EU. These split views will therefore be reported in the "Concluding remarks and recommendations for future work" chapter of the BREF.

A possible formulation of these split views could be:

BAT conclusion	Dissenting view	Expressed by	Alternative proposed level (if any)
BAT 22 bis	*Delete in the BAT statement the reference to 'with the following order of priority'.* *Delete in the BAT statement the last sentence 'Technique (d) is BAT only for existing plants and provided that it ensures at least an equivalent level of environmental protection compared to using technique (c) in combination with techniques (a) or (b).'*	*EGGA, ES* [2] *supported by IT and PT*	*NA*

[2] ES proposed in addition to use the occupational exposure limit values for HCl established according to Commission Directive 2000/39/EC of 8 June 2000 for demonstrating that an equivalent level of environmental protection can be achieved with technique (d).

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3.1.2 Higher end of BAT-AEL range for channelled HCl emissions to air from pickling and stripping with hydrochloric acid in batch galvanising (EGGA)

Conclusion of the meeting
Slide 324 / BAT 22bis / Table 9.33:

Table 9.33: BAT-associated emission level (BAT-AEL) for channelled HCl emissions to air from pickling and stripping with hydrochloric acid in batch galvanising

Parameter	Unit	BAT-AEL (Daily average or average over the sampling period)
HCl	mg/Nm³	< 2 – ~~10~~5 6 ~~(*)~~
~~(*) The BAT-AEL does not apply when technique (a) is used.~~		

Split view summary
EGGA proposes that the upper end of the BAT-AEL range is increased from 6 mg/Nm³ to 10mg/Nm³, such that the BAT-AEL becomes <2-10 mg/Nm³.

The split view is accompanied by the following rationale

- The BAT-AEL of <2-10 mg/Nm³ was the outcome of evaluations at the 2nd Data Workshop and information submitted immediately thereafter. The reasons for the originally proposed upper end of the range were not considered during the evaluation of proposals to lower the range during the Final TWG Meeting.
- The 2nd Data Workshop noted that Chart 56 contained a large number of operational scenarios and that plants operating outside the parameters of technique (d) and with fully enclosed pretreatment and wet scrubbers were only a subset of the plants designated in Chart 56 as 'plants with enclosed pre-treatment'.
- The data set includes a wide range of situations – including plants operating with sufficiently low temperature/concentration that potential emissions are low regardless of abatement efficiency. Even when enclosed (noting that enclosures may not be installed solely for the purposes of abatement of channelled HCl emissions), the abatement at these plants requires different performance characteristics to plants that are operating outside the temperature and concentration range. The assessment should also take into account the intensity of production by considering for example the number of pickling tanks relative to production throughput.
- The BAT-AEL should therefore be derived based on the plants operating (for production reasons) outside the temperature and concentration range defined by technique (d). This would appear to be plants 58, 61, 284, 65, 3-1, 224 and 262. Plants 296, 295-1 and 51 would possibly be included depending on interpretation of their reported temperature range.
- A BAT-AEL upper limit of 10 mg/Nm³ is significantly lower than the current permit ELV for the plants cited above (ELVs ranging from 15 mg/Nm³ to 30 mg/Nm³. There are important cross-media effects to consider (increased volume of washer waters) when operating at levels below 10 mg/Nm³.

Information on which the split view is based

- EGGA information submitted in the follow-up to the 2nd Data Workshop (16 December 2016) [in BATIS];
- EGGA staff working notes of Chart 56 provided to EIPPCB staff following the 2nd Data Workshop (email communication to Gabriele Klein of 18 December 2016);
- Data for Plants 58, 61, 284, 65, 3-1, 224, 262, 296, 295-1 and 51;
- Detailed explanation for Plant 262 and consequences of proposed BAT-AEL range (EGGA submission of 16 December 2016).

EIPPCB assessment
The documents and information referred to in the split view were available on time.

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Validity of supporting rationale:

- The data collection shows that there are plants in the data collection that apply collection and abatement for HCl emissions reduction and have reported emission concentrations within the range of 6-10 mg/Nm^3.

EIPPCB conclusion
Taking these aspects into account, the EIPPCB considers that the split view representing the opinion of EGGA fulfils the conditions set out in Section 4.6.2.3.2 of Commission Implementing Decision 2012/119/EU. This split view will therefore be reported in the "Concluding remarks and recommendations for future work" chapter of the BREF.

A possible formulation of this split view could be:

BAT conclusion	Dissenting view	Expressed by	Alternative proposed level (if any)
BAT 22 bis / Table 9.33	*Increase the higher end of the BAT-AEL for channelled HCl emissions to air from pickling and stripping with hydrochloric acid in batch galvanising.*	*EGGA*	*< 2-10 mg/Nm^3*

Annex V: Recommendations for future work (part of Chapter 10 of FMP BREF)

The information exchange revealed a number of issues that should be addressed during the next review of the FMP BREF. The recommendations for the next review include the following:

- General recommendation:
    - To collect more information in the next BREF review on some of the BAT candidate techniques under the headings 'Environmental performance and operational data' and 'Economics' for which limited or no information was supplied by the TWG during this BREF review.

- Related to emissions to air:
    - To collect technical information on the specific cases (processes) where the oxygen in the waste gas of combustion processes is increased to a level very close to 21 vol-% as a result of additional air intake for safety reasons. In all cases, the oxygen content at which the emission concentrations are measured shall be systematically collected.
    - To collect further information on the use of electricity generated from fossil-free energy sources in heating processes (e.g. cross-media effects, example plants).
    - To collect further information on the techniques applied for limiting the entrainment of dust in reheating furnaces.
    - To collect more information on air preheating temperature for continuous and batch annealing.
    - To collect more information on NOX emission data for the batch galvanising sector and especially for plants equipped with canopy heaters (e.g. high-temperature galvanising).
    - To collect more data on HF emissions from pickling of stainless steel using acid mixtures containing both H2SO4 and HF with injection of H2O2.
    - To collect further information on SOX emissions from pickling of wire rods in wire drawing.
    - To collect further information on zinc emissions from hot dip coating of wires and batch galvanising.
    - To collect further information on the monitoring of volatile substances and metals (e.g. chromium, nickel) from post-treatment processes.
    - To collect more information on:
        - NOX and dust emissions from the recovery of mixed acid by spray roasting and evaporation;
        - NH3 emissions to air from the recovery of mixed acid by spray roasting, when SCR is used for NOX abatement.
    - To collect additional information on the emission concentrations achieved when applying only a restricted operating range for hydrochloric acid open pickling baths, demonstrating that an equivalent level of environmental protection is

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ensured in comparison to using extraction (either form the enclosure section or from the lateral hood or lip extraction) in combination with wet scrubbing followed by a demister.

- To collect more information on:
  - dust generation levels from roughing, rolling and welding processes as well as on applied abatement techniques;
  - dust emissions from shot blasting operations in the case of stainless steel.

- Related to specific energy consumption:
  - To collect more information on post-heating of heavy plates, bars and rods in the case of repetitive heat treatment steps (i.e. cases where the feedstock is heated more than once in the same or different furnaces).
  - To collect more information on the specific energy consumption levels in the case of feedstock processed using multiple annealing cycles.
  - To collect more information on (i) the annealing temperatures employed in cold rolling and hot dip coating, (ii) the technical reasons for operating at high annealing temperature (> 800 °C) and (iii) the associated energy consumption of annealing furnaces.
  - To collect more information on specific energy consumption for:
    - BG centrifuge plants;
    - high-temperature BG plants (galvanising bath temperature above 500 °C);
    - BG plants with a low average yearly production throughput;
    - BG plants with a high share of thin products.
  - To collect more information on the specific energy consumption levels in the case of cold rolling plants producing high-strength steel.
  - To collect more information on the specific energy consumption levels in wire drawing plants.

- Related to specific material consumption:
  - To collect more information on:
    - specific consumption of pickling and stripping acid for plants carrying out regalvanising of feedstock;
    - specific consumption of pickling acid in CR, HR, HDC and WD sectors;
    - specific consumption of plants carrying galvanising workpieces with a high specific surface area (e.g. tubes, cable trays);
    - the characterisation of the specific surface area (e.g. high specific surface area).
  - To collect further information on possible uses of oily sludge as well as on the characteristics of oily sludge in terms of contaminants (e.g. halogens, metals).

- Related to water consumption:
  - To collect more information on the water consumption associated with cooling processes.
  - To collect more information on the water consumption at the process step level.

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- Related to emissions to water:
  - To collect more information on:
    - emission concentrations of dissolved Fe in waste water streams and its contribution to the total suspended solids and total Fe emission concentrations;
    - emission concentrations of Ni from plants producing austenitic stainless steel;
    - cases where FMP plants are receiving waste water from iron and steel production plants, in particular related to the pollutant loads.
  - To collect more information on the emission concentrations for indirect discharges of Hg and information on the potential origin of the Hg emissions.

Suggested topics for future R&D work

The Commission is launching and supporting, through its Research and Technological Development programmes, a series of projects dealing with clean technologies, emerging effluent treatment and recycling technologies and management strategies. Potentially, these projects could provide a useful contribution to future BREF reviews. Readers are therefore invited to inform the European IPPC Bureau of any research results which are relevant to the scope of this document (see also the fifth section of the Preface of this document).

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