Best Available Techniques

Best Available Technique (BAT) Conclusions for the Production of Pulp, Paper and Board

Implementation guide

Discussion on the BAT conclusions for the pulp and paper sector

Confederation of European Paper Industries (CEPI)

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Foreword

The new BAT conclusions for the production of pulp, paper and board was published in all EU languages in the *Official Journal of the European Union* on 30 September 2014 containing the legally binding requirements for all pulp, paper and board producers located in Europe. With the adoption of the Industrial Emissions Directive (IED) in 2010 for the permitting and control of emissions of installations, BAT conclusions become legally binding for all industrial and energy operators.

The publication of the BAT conclusions for pulp, paper and board production manifests the start of a four year period of intensive work. By 1 October 2018, all European pulp, paper and mills must consider the new BAT conclusions and adhere to them in their permit to operate.

The permit conditions, including emission limit values, must be based on the new BAT conclusions. All mills must have revisited their environmental permit, discussed the suggested (non-prescriptive) best available techniques (BAT) and the (prescriptive) BAT conclusions with the permitting authority, and where feasible, have implemented necessary measures in the mill.

Coordinated by the European Commission's European IPPC Bureau in Seville, the revision of the original best available techniques reference document for pulp and paper manufacturing (BREF-PP, published 2001) started already in 2006. The revised BREF-PP, published in May 2015, is a background document to the new BAT conclusions for the paper sector. It details over 900 pages pulp and paper production processes, lists BATs to consider, associated emission levels, etc. BREFs are only available in English; they have no legal status but are reference for those involved in setting permit conditions for installations.

The Confederation of European Paper Industries (CEPI) has issued an implementation guide with the objective to give mill operators and environmental managers an understanding of principles and views of importance while considering the need to revise the permit.

This implementation guide discusses the BAT conclusions for the sector. It also includes a question and answer section. The guide is developed by and for industry with the purpose to help pulp and paper mills during discussions with authorities on the implementation of the new BAT conclusions.

As circumstances and interpretations differ among all EU member states, CEPI's ambition is to support and guide operators of the sector. Doing this, we take a view that is achievable for operators within the legal framework. In the end, decisions are taken by the national or local competent authorities and, where necessary, reviewed by the judiciary.

The guide is not intended for the competent authorities but to help you to refer to official documents published by the EU (in your language) and in national legislation. In order to further support industry mills operators and managers before the implementation deadline, CEPI has set up a helpdesk for frequently asked questions. For more information, see CEPI website at www.cepi.org. For questions, contact email is batpulppaper@cepi.org.

Brussels, July 2015 – Confederation of European Paper Industries (CEPI)

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1. General BAT Conclusions for Pulp and Paper Industry

There are 53 BAT conclusions in total developed for the purpose of controlling pulp and paper production. Of these, 18 are of relevance to all sub-sectors of pulp and paper production. The remaining 35 BAT conclusions concern five major types of processes: kraft pulping (14 conclusions); sulphite pulping (7); mechanical and chemi-mechanical pulping (2); processing paper for recycling (5); and papermaking and related processes (7).

The first part of the BAT conclusion chapter contains general BAT conclusions (BAT 1 to 18) which apply to all pulp and paper mills for the production of pulp, paper and board. Operators of a mill should be prepared to review all general BAT conclusions during the four year period before the BAT conclusions must enter into force (1 October 2018). Especially in a permit application process, the mill operator should compare the new BAT conclusions with how the mill is operated and state any additional measure it finds necessary.

BAT 1 – Environmental management system

In order to improve the overall environmental performance of plants for the production of pulp, paper and board, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the [nine] features listed.

In this BAT, we find a long and detailed description of features (principles, requirements) of an environmental management system (EMS). This BAT is horizontal and appears in all sector-specific BAT conclusions (i.e. not only applicable to pulp and paper manufacturing).

According to the BAT, an operator shall implement and adhere to all of the EMS measures listed. However, under the sub-title ”applicability” the requirement is softened by stating that the level of details and nature of the EMS is related to the characteristics of the installation and the environmental impact it may have. There is no requirement to apply, for example, EMAS or ISO 14001 standards and no third party verification is required.

However, in reality, most mills are complex enough installations with sufficient impact to make this BAT applicable. Considering there is no actual requirement to have certified ISO 14001 or registered EMAS, the environmental management system will need to have all the constituents of a certified or registered system and be audited to confirm its compliance. In such circumstances, having such a system or one with at least a third party audit, allows for the certificate and audit report to provide the evidence of compliance with BAT 1.

BAT 2 – Materials management and good housekeeping

BAT is to apply the principles of good housekeeping for minimising the environmental impact of the production process by using a combination of the [seven] techniques given.

The wording used in this BAT is somewhat vague, e.g. with the words “minimise”, “avoid” and “proper”. For most pulp and paper mills, however, there should be no major difficulty to demonstrate compliance with this BAT.

BAT 3 – Chelating agents from bleaching

In order to reduce the release of not readily biodegradable organic chelating agents such as EDTA or DTPA from peroxide bleaching, BAT is to use a combination of the [three] techniques given.

a) Discharged amounts of chelating agents should periodically be monitored.
b) The process should be optimised to reduce consumption and emissions of not readily biodegradable chelating agents.
c) Use biodegradable chelating agents when there are available biodegradable substitutes meeting the brightness requirements.

Point (b) is only applicable to mills where less than 70% of the chelating agent is eliminated in the waste water treatment plant. The requirement is somewhat unclear as the term “eliminated” is not defined. Even if it literally means reduction of carbon dioxide (CO_2), water and inorganic nitrogen compounds, the applicability clause should be understood as the analytical method used for determining that the chelating agent shows a reduction of at least 70% of EDTA/DTPA in the treatment plant.

Point (c) is more wishful thinking than a current possibility. The availability of appropriate substitutes (biodegradable agents meeting, e.g. brightness requirements of pulp) has also been assessed in the context of the Water Framework Directive under the environmental quality standards (EQS) for releases of pollutants to waters (priority substances). In 2014, a scientific panel advised the European Commission not to introduce any new legal quality requirements regarding EDTA as no sufficient alternative is available on the market.

BAT 4 – Wood storage and preparation

In order to reduce the generation and the pollution load of waste water from wood storage and preparation, BAT is to use a combination of the [five] techniques given.

The five techniques listed are:

a) dry debarking
b) avoidance of contamination of wood and bark with sand and stones
c) paving wood yards
d) controlling flow of sprinkling water and minimising run off water
e) collection of contaminated run off water followed by separation of suspended solids before biological treatment

Dry debarking (a) is indirectly defined by the flow of waste water. Here, an indicative BAT associated environment performance level (BAT-AEPL) is specified. In this case, the BAT-associated effluent flow from dry debarking of 0,5 - 2,5 m^3/ADt was reported by pulp mills to the European IPPC Bureau during the review process. It is not specified to which type of pulp the associated effluent flow figures refer to (the data submitted originates from kraft pulping mills). Other types of mills may have different water flow ranges in relation to the yield.

There are some restrictions given for the applicability of the techniques. The applicability of the collection of contaminated run off water technique (e) may be restricted by the degree of contamination of the run-off water and the size of the treatment plant. In a real situation, however, these two restrictions will often show that treatment of run-off water in the waste water treatment plant cannot be regarded as BAT.

BAT 5 – Reduction of fresh water use

In order to reduce fresh water use and generation of waste water, BAT is to close the water system to the degree technically feasible in line with the pulp and paper grade manufactured by using a combination of the [seven] techniques given.

Techniques are listed to reduce fresh water use and waste water generation. In a permitting situation, the mill should discuss the techniques in relation to how the mill is operated. The need to reduce fresh water use differs considerably among EU member states depending on location (river basin), population density, seasonal variations, etc.

Options for water recirculation reuse and closing of water loops can, according to the BAT conclusions, be generally applicable or restricted to new plant or major refurbishment situations (as well as water and product quality requirements, technical constraints or increase odour nuisance). At the time of publication of this guide, the European Commission is considering the setting of EU standards for water that would help tackle water scarcity in a more efficient way; however the outcome is not available and may take additional time.

In the table yearly average associated flow BAT-AEPL ranges for discharges after different processes are listed. This BAT gives performance levels in m^3/tonne of a product for the waste water flow at the point of discharge after the waste water treatment. As for all BAT-AEPLs, there is no legal obligation under IED for a mill to perform within the ranges given.

Some EU member states may use these as benchmark levels expecting all mills to be within the range. As a consequence, exceeding the upper BAT-AEPL range may result in a permit condition to reduce fresh water use.

Note that reducing the water flow (i.e. the BAT-AEPL ranges) can impact the concentration of emissions in mg/litre if these are transformed from BAT-AEL upper level to load (kg/ADt). One example to illustrate the effect of reducing flow impact concentration is:

- BAT-AEL upper level COD emission for bleached kraft is 20 kg/ADt. The BAT-AEPL is 25-50 m^3/ADt.
- If, for example, 40 m^3 of effluent water is discharged, the corresponding concentration is 500 mg/l. If the flow in a real operating situation is higher than 40 m^3, the BAT-AEL requirement (in kg/ADt) will not be met with 500 mg/ml.

It is important to stress that there are no BAT-AELs expressed in concentration. There is a risk of increasing waste water effluent flow to meet this supposed BAT-AEL in mass (load).

BAT 6 – Energy consumption and efficiency

In order to reduce fuel and energy consumption in pulp and paper mills, BAT is to use technique (a) and a combination of the other [nine] techniques given.

This BAT conclusion states that it is BAT to have an energy management system together with a combination of nine other techniques. An energy management system can be within an environmental management system (EMS) or stand alone.

There are no associated BAT-AEPLs for energy consumption. There is no specific energy consumption data in the BAT conclusion chapter but in the relevant chapters of the BREF-PP document. This is largely due to the fact that energy data collected was not complete.

There are no requirements in the IED to apply data not included in the BAT conclusions chapter. However, a competent authority can, in a permitting situation, use (qualified) data available in the BREF-PP document and ask the operator for technical possibilities and costs for reaching a certain (lower) level of energy consumption. The basis for such a request would be that it is a general principle/requirement of the IED to use energy efficiently.

In this context, do not forget the requirements of the energy efficiency directive (EED). Meeting the EED requirements should suffice to prove this BAT conclusion.

There is no applicability clause stating (more or less) similar to BAT 1 on environmental management system (EMS) that the level of detail and nature of the system depends on the complexity of the installation.

A remark on combined heat and power plant (CHP) is that the economic viability of having CHP depends mainly on the costs of electricity and fuels (achievable savings and payback time varies among EU member states). CHP could be seen as a negative technique for the environment vis-à-vis an increase of emissions at site level, to which IED authorisation applies, while it provides an overall environmental benefit reducing emissions elsewhere.

BAT 7 – Emissions of odour from waste water system

In order to prevent and reduce the emission of odorous compounds originating from the waste water system, BAT is to use a combination of the [three plus eight] techniques given.

In order to avoid conditions where waste water or sludge becomes anaerobic, a number of measures (eight techniques) are listed for two different situations:

i) for odours related to water systems closure (three techniques); and
ii) for odours related to waste water treatment and sludge handling.

The techniques listed can be seen as a shopping list when problems have occurred, rather than preventive measures to be taken. For example, the use of biocides is proposed in order to control odour related to water systems closure. Of course, this should not mean reducing one environmental problem while creating another problem elsewhere.

Competent authorities may approach the (subjective) odour issue differently. One example is an approach based on known issues: only where there is a proven existing problem, will mills be required to provide a plan for reducing odour, otherwise the competent authorities consider this BAT of minor importance.

BAT 8 – Monitoring key process parameters

BAT is to monitor the key process parameters according to the table given below.

This BAT only deals with key parameters for combustion processes and waste water treatment. The parameters and monitoring frequencies given are what one wold normally expect to be used at a pulp and paper mill.

BAT 9 – Monitoring emissions to air

BAT is to carry out the monitoring and measurement of emissions to air, as indicated, on a regular basis with the frequency indicated and according to EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards which ensure the provision of data of an equivalent scientific quality.

Frequency of monitoring should be based on stability of emissions to air and relevance of the impact. Frequencies given in the table are not prescriptive, but probably reasonable and what could normally be expected by pulp and paper mills of a large or medium size of today. Analyses are to be made according to EN standards or, if not available, other standards which ensure data with an equivalent scientific quality.

BAT 10 – Monitoring emissions to water

BAT is to carry out the monitoring of emissions to water, as indicated, with the indicated frequency and according to EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.

Frequency of monitoring should be based on stability of emissions to water and relevance of the impact. Frequencies given in the table are not prescriptive, but probably reasonable and what could normally be expected by pulp and paper mills of a large or medium size of today. Analyses are to be made according to EN standards or, if not available, other standards which ensure data with an equivalent scientific quality.

One example where a deviation can be reasonable is the daily monitoring frequency for chemical oxygen demand (COD) and total suspended solids (TSS). During weekends, for example, many mills analyse a 72 hour sample.

BAT 11 – Monitoring of diffuse TRS emissions

BAT is to regularly monitor and assess diffuse total reduced sulphur emissions from relevant sources.

Weak odorous gases are non-condensable total reduced sulphur (TRS) containing gases which typically come from washing filters, tanks, chip bins, and lime mud filters. Weak gases can be channelled and burnt together with strong odorous gases in recovery boilers, lime kilns or dedicated burners for TRS gases.

Residual weak gases are weak gases not channelled for incineration in a recovery boiler, a lime kiln or a dedicated burner for TRS gases. Diffuse TRS emissions are defined as

emissions resulting from a direct (non-channelled) contact of volatile odorous compounds with the environment.

In practice, the difference between “residual weak gases” and “diffuse TRS emissions” is small, or perhaps even non-existent. In the table for monitoring of air emissions in BAT 9, it is however recommended to periodically monitor both diffuse emissions and residual weak gases.

According to the monitoring table, the major non-channelled emissions sources for odorous gases should be monitored periodically. The monitoring frequency for the major emission sources should be discussed with the competent authority. The remaining, often many and small sources, may be assessed. Such an assessment can be based on inventories made. After major process changes it may be appropriate to make a new inventory.

BAT 12 – Waste management

In order to reduce the quantities of wastes sent for disposal, BAT is to implement a waste assessment (including waste inventories) and management system, so as to facilitate waste reuse, or failing that, waste recycling, or failing that, ‘other recovery’, including a combination of the [seven] techniques given.

A number of techniques are listed aiming at facilitating reuse, recycling and other recovery of waste.

There are no BAT-AEL values for waste in the BAT conclusions for pulp and paper production.

BAT 13 – Reduce emission of nutrients (N and P)

In order to reduce nutrient (nitrogen and phosphorus) emissions into receiving waters, BAT is to substitute chemical additives with high nitrogen and phosphorus contents by additives containing low nitrogen and phosphorus contents.

The purpose of this BAT is to substitute chemical additives with a high content of nitrogen (N) and phosphorous (P) by additives with low contents.

The BAT is applicable if the nitrogen in chemical additives is not bioavailable (i.e. it cannot serve as a nutrient in the biological treatment plant) or if the nutrient balance is in surplus. In other words, the BAT is not applicable if the nitrogen in additives is bioavailable or if the nutrient balance is in deficit.

Phosphorous (P) is not mentioned in the applicability clause (possibly a mistake while drafting the text?).

Most mills today have to add nutrients to the treatment plant. If N and P in chemical additives are bioavailable it means that fewer nutrients have to be added, thus reducing operating costs for the mill.

The practical consequences this BAT could have on the use of chelating agents and certain nitrogen containing wet strength agents are limited as nitrogen in these chemicals are

probably not bioavailable in the waste water treatment plant. Moreover, there are currently no alternatives available.

To summarise, it is difficult to see that this BAT will have any impact on mills in practice.

BAT 14 – Waste water treatment

In order to reduce emissions of pollutants into receiving waters, BAT is to use all of the [two] techniques given.

This BAT lists two very general groups of waste water treatment (primary and secondary treatment).

Even if a BAT requirement, as in this case, states that a "BAT is to use all the techniques given", a mill does not necessarily have to install treatment techniques belonging to the two general groups listed in order to comply with the requirements under IED. A mill could have taken such far reaching preventive measures that neither primary nor secondary treatment is necessary to achieve emission level within the BAT-AEL range. Mills could, for example, have installed widely proven membrane technology for the flows and characteristics of pulp and paper effluent. In practise, however, mills would need both techniques to comply.

This BAT is not applicable where the biological load of waste water after primary treatment is very low (as technically it would not support secondary treatment).

BAT 15 – Tertiary waste water treatment

When further removal of organic substances, nitrogen or phosphorus is needed, BAT is to use tertiary treatment as described in Section 1.7.2.2.

A mill has the freedom to decide which combination of internal, preventive, measures and external, end of-pipe control measures it needs to take in order to meet a BAT-AEL for discharges of pollutants into receiving waters.

The discussion with the competent authority should focus on the fact that it is an additional measure to nutrient removal considering sensitive reception water bodies which has cross-media effects (moving or causes environmental impact somewhere else).

BAT 16 – Biological waste water treatment

In order to reduce emissions of pollutants into receiving waters from biological waste water treatment plants, BAT is to use all of the [three] techniques given.

This BAT lists self-evident measures to take if the mill has a biological treatment plant.

BAT 17 – Emissions of noise

In order to reduce the emissions of noise from pulp and paper manufacturing, BAT is to use a combination of the [ten] techniques given.

This BAT lists ten different measures for consideration. They span a wide spectrum from an ambitious investigation of possible measures in a noise-reduction programme, via strategic planning and management techniques, to examples of individual measures which can be taken.

There are no associated BAT-AELs, in spite of the circumstance that noise is considered an emission in the IED, and that pulp and paper mills typically can generate noise problems.

Competent authorities may approach emissions of noise differently (like odour it is somewhat subjective). One example is the approach which is based on known issues. Only where there is a proven existing problem, will mills be required to provide a plan for reducing the noise level; otherwise the competent authorities would consider this BAT to be of minor importance.

BAT 18 – Decommissioning

In order to prevent pollution risks when decommissioning a plant, BAT is to use the general [five] techniques given.

The techniques listed can be seen as complementary and, to a certain extent, superfluous, given the requirements in IED to monitor soil and groundwater, and to prepare a baseline report.

2. BAT Conclusions for Kraft Pulping Process

BAT conclusions for kraft pulping processes are BATs 19 to 32. The BAT-AELs are for the pulping process only.

Integrated mills must also take BAT conclusions BAT 49, 51, 52c and 53 for paper making into account.

BAT 19 – Waste water and emissions to water

In order to reduce emissions of pollutants into receiving waters from the whole mill, BAT is to use TCF or modern ECF bleaching and a suitable combination of the techniques specified in BAT 13, BAT 14, BAT 15 and BAT 16 and of the [seven] techniques given.

Descriptions of ECF and TCF are given in the BREF-PP document, see section 1.7.2.1.

A number of process techniques are listed. To be more precise, the list contains technologies. “Techniques” not only include technologies used but also how the installation is designed, built, maintained and operated. The listed techniques do not address these aspects. On the other hand, this may not have a profound effect on its implementation as the “techniques” described are not prescriptive.

Table 1 introduces BAT-AELs for the direct waste water discharge to receiving waters from a bleached kraft pulp mill. The figures are in kg/ADt bleached kraft pulp, either sold or used at the mill itself to produce paper. By definition an ADt has a dryness of 90%. The BAT-AELs given are not applicable to dissolving pulps.

The table uses the wording “direct waste water discharges to receiving waters” means that the BAT-AELs do not apply if the waste water is treated outside the installation, e.g. in a municipal waste water treatment plant.

It is explicitly stated that the reference waste water flow for kraft pulp mills can be found in BAT 5. As mentioned elsewhere in the guide, BAT-AEPLs are for authorities’ information.

At the final TWG meeting in Seville on the final draft BREF-PP (April 2013), the European IPPC Bureau informed the technical working group that the associated emission levels (AELs) refer to discharges from the waste water treatment plant only. Some mills, however, may face competent authorities with a view that these figures represent the total discharges from the mill, i.e. including water not treated at the plant (for example cooling water). For water flows, it seems reasonable to deduct any pollution emanating from the intake water.

According to footnote 2, “slightly higher” values can be accepted as BAT-AELs for nitrogen (N) and phosphorous (P) emissions if a compact biological waste water treatment plant is installed. This footnote was introduced as a last minute compromise; therefore the acceptable level of the “slightly higher” emissions is not specified but to be discussed with the competent authority.

Eucalyptus pulp generally has higher BAT-AELs for phosphorous (P) emissions compared to other pulp. Footnote 3 to the table informs that the upper end of the range for eucalyptus pulp refers to situations when certain P-rich eucalyptus species are used.

Footnote 5 says that for certain pulp qualities, higher AOX emission levels “may occur”. The understanding is that the BAT-AEL upper level for those pulp qualities is 0,25 kg/ADt.

One observation is that, in contrast to BAT-AELs for total nitrogen (N) emissions for mechanical pulping, there is no footnote stating that emission of nitrogen can be higher due to the use of non-degradable chelating agents.

Table 2 introduces BAT-AELs for unbleached kraft.

There is no definition here of bleached and unbleached kraft pulps. It is understood that unbleached pulp has not been bleached after any oxygen delignification stage.

There are fewer footnotes in table 2 and the ones given already appear in table 1.

Under the table there is a sentence informing readers that “the BOD concentration in treated effluents is expected to be below (around 25 mg/l as a 24 hour composite sample)”. This sentence is valid for both tables. The BOD concentration provided is not considered a BAT-AEL but an *indicative* value with the purpose of providing guidance to the authorities with information on how a well-designed and operated biological treatment plant can perform when it comes to easily degradable organic matter. Indicative values are not legally binding.

BAT 20 – Reduction of emissions in strong and weak odorous gases

In order to reduce odour emissions and total reduced sulphur emissions due to strong and weak odorous gases, BAT is to prevent diffuse emissions by capturing all process-based sulphur containing off-gases, including all vents with sulphur-containing emissions, by applying all of the [three] techniques given.

The BAT includes a BAT-AEL of total reduced sulphur (TRS) emitted in residual weak gases (0,05-0,2 kg S/ADt). Although BAT is to consider all the techniques given in the table, there is no requirement according to IED to apply them as long as the emissions under normal operating condition are below the upper end range BAT-AEL value of 0,2 kg S/ADt.

In the applicability section it is stated that the techniques are generally applicable to new plants and for major refurbishments of existing plants.

For existing plants, the application text implies that competent authorities may set higher permit levels having considered high costs due to the lay-out or space restrictions as well as limitation on incineration due to safety reasons. While BAT-AELs apply in all cases, with or without applicability constraints, any applicability constraint can be used if applying for an IED Article 15.4 derogation. Hence, a mill with BAT applicability constraints can have permit emission limit value exceeding 0,2 kg S/Adt if granted in a permit by the competent authority.

The BAT-AEL provided is for total reduced sulphur (TRS) in residual weak gases. By definition, these gases do not comprise weak gases incinerated in recovery boilers, lime kilns or dedicated burners. Residual weak gases, however, by definition include gases from chip pans after treatment, e.g. in a scrubber.

The BAT-AEL has no specified averaging period. The mill should discuss a reasonable monitoring frequency with its competent authority; see also comments provided in BAT 11.

IED requires that emissions under normal operating conditions are below the BAT-AEL upper level. This means that IED requirements for emissions of total reduced sulphur (TRS) under non-normal operating conditions do not apply. One example of non-normal operating conditions is emissions of pollutants in odorous gases intended to be treated in a recovery boiler, a lime kiln or a dedicated burner. In case of no treatment due to non-normal operating conditions, this BAT requires such emissions to be recorded.

BAT 21 – SO2 and TRS emissions from recovery boilers

In order to reduce SO2 and TRS emissions from a recovery boiler, BAT is to use a combination of the [three] techniques given.

In table 3 there are BAT-AELs for SO_2 expressed as daily and annual averages in concentration (mg/Nm^3) and as annual averages in load (kg/ADt). There is an ongoing debate about whether both the daily average value and the annual average value apply (for an operator) simultaneously or if only one emission limit value (ELV) would be considered acceptable in order to legally comply with IED requirements. On this matter, the view expressed by the European Commission (at the final TWG meeting in April 2013) is that both the daily average value and the annual average value apply. This would mean that a mill can have one permit condition for daily averages (as concentration) and another permit condition as annual average (either as concentration or load). Which one of the annual averages being the stricter depends on the gas flow. In the end, decisions are taken by the competent authorities and, where necessary, a final verdict may eventually be given by the judiciary.

Footnote 1 states that an increase of dry substance (DS) (which is given as per cent) in black liquor results in lower SO_2-emissions but can give emissions of NOx in the higher end of the BAT-AEL-range, and vice versa (see also BAT 22). An integrated approach should be followed when establishing BAT-AELs for emissions to air as cross-media effects may occur (in this case between SO_2 and NOx emissions and vice versa as described in the BREF-PP document). The footnote could give the competent authorities guidance when setting ELVs.

Footnote 2 states that a low level of dry substance can be considered under non-normal operating conditions to which the BAT-AELs of the table do not apply.

Footnote 3 covers the situation where a mill has a dry substance (DS) of over 83%. The emission of SO_2 would (may) then be low. However, the need to set permit conditions on a case-by-case basis, as indicated in the footnote, may not appear in practice. A similar footnote appears for NOx emissions (BAT 22) which may be more relevant case by case.

Footnote 4 states that the total reduces sulphur (TRS) values as daily averages are applicable when odorous gases are not burnt. This footnote does not refer to the corresponding annual averages.

BAT 22 – NOx-emissions from recovery boilers

In order to reduce NOx emissions from a recovery boiler, BAT is to use an optimised firing system including all of the [three] features given.

In spite of the fact that the listed techniques states that it is BAT to use an optimised firing system including "all of the features" below, according to IED, this is not required as long as (at least) an equivalent level of environment protection is ensured. Hence, the BAT-AEL upper level is the equivalent level of environment protection.

Table 4 with BAT-AELs has only yearly averages – one set for concentration (mg/Nm^3) and one set for load (kg/ADt). The two sets are thus to be seen as alternatives.

Depending on gas flow the two alternatives will be differently strict. It seems that a gas flow of between 7.000 and 8.000 Nm^3 have been used. [Each mill will calculate based on real flow.] The table has different levels for hardwood and softwood and for two different levels of DS in the black liquor.

Footnote 2 deals with the fact that the NO_X-emissions depend on dry substance (DS), nitrogen (N) content of black liquor, and other nitrogen containing flows burnt. The higher nitrogen content, the closer to the upper end of the BAT-AEL range the emissions will reach.

An integrated approach should be followed when establishing BAT-AELs for emissions to air as cross-media effects may occur (in this case between SO_2 and NOx emissions and vice versa, as described in the BREF-PP document). The footnote could give the competent authorities guidance when setting emission limit values (ELV), see also BAT 21.

Footnote 3 offers the possibility to set NO_X emission levels on a case-by-case basis, i.e. higher than the upper end BAT-AEL value, in cases where dry substance in black liquor exceeds 83%. In some cases, this may render an IED Article 15.4 derogation. However, the footnote gives the possibility to set higher emission limit values in a permit without granting IED 15.4 derogation. Legally speaking, a footnote is valid as a BAT-AEL range of a table.

BAT 23 – Dust emissions from recovery boilers

In order to reduce dust emissions from a recovery boiler, BAT is to use an electrostatic precipitator (ESP) or a combination of ESP and wet scrubber.

Table 5 provides BAT associated emission levels (BAT-AELs) for dust emissions from a recovery boiler. The values are given as annual averages in both concentration and load (in kg/ADt). These are alternatives, and only one of them must be reflected as a condition in the permit in order to comply with the IED. There are different levels for "existing" dust abatement systems and for "new or major refurbishment".

Even if not essential in practice, one can see that the lower levels in concentration (mg/Nm^3) are stricter than corresponding levels in load (kg/ADt). For the BAT-AEL upper levels, the two sets correspond roughly to a fairly normal 8.000 Nm^3/ADt flow while the lower levels correspond to an atypical 2.000 Nm^3/ADt.

Footnote 1 provides the competent authority with a tool to allow higher emissions (50 mg/Nm^3 instead of 40 mg/Nm^3) when an existing ESP equipment is approaching the end of

its operational life. The rationale behind this footnote is that mills should not be forced to invest in a new ESP before the existing one has reached the end of its technical economical life. The prerequisite is, however, that the emissions are below 50 mg/Nm^3.

When ESP equipment is “approaching the end of its operational life” it is probably site-specific and should be discussed by the mill with the competent authority. ESP equipment has an expected (normal) operational lifetime of probably 10 to 15 years.

The BAT-AEL values are stricter for new dust abatement systems and for systems which have gone through a major refurbishment than existing ones. Moreover, for such systems, there is no option for higher BAT-AELs when systems approach the end of their operational life.

BAT 24 – SO2 emissions from lime kilns

In order to reduce SO2 emissions from a lime kiln, BAT is to apply one or a combination of the [four] techniques given below.

The list of techniques includes a supporting text explaining that “BAT is to apply one or a combination of the techniques”. The listed techniques are to be seen as examples of how the BAT-AELs in table 6 can be met.

In table 6, there are yearly average levels in concentration (mg/Nm^3) for sulphur dioxide (SO_2) and levels in load (kg/ADt) for gaseous S (TRS-S + SO_2-S). The values should be regarded as alternatives in spite of the fact that the parameters are not exactly the same. The argument for such an approach is not only that they are both yearly averages but also that there are separate yearly BAT-AELs in mg/Nm^3 for TRS-S in table 7.

Footnote 1 provides information that “strong gases” include methanol and turpentine. However, methanol and turpentine are not usually considered as strong gases. The intention is, however, that both these two sulphur rich fuels and strong gases are acceptable reasons for increased emission limit values (ELVs) of the permit. This is because the higher ELVs (of a permit) for “strong gases” also apply if methanol and/or turpentine are burnt, regardless of whether (other) strong gases are burnt or not.

BAT 25 – TRS emissions from lime kilns

In order to reduce TRS emissions from a lime kiln, BAT is to apply one or a combination of the [three] techniques given.

Table 7 shows BAT-AELs as a yearly average. Clearly, the yearly average values are less useful when it comes to possible odour problems. A footnote states that “strong gases” include methanol and turpentine. The footnote is clear in that burning of strong gases means that the upper BAT levels may increase considerably (quadruple).

BAT 26 – NOX emissions from lime kilns

In order to reduce NOx emissions from a lime kiln, BAT is to apply a combination of the [four] techniques given.

In table 8, the BAT-AEL values are provided in sets of two: one for liquid fuel and one for gaseous fuel. As both sets are yearly averages, they are considered alternatives.

There is no BAT-AEL for biomass fuel. It will be for the competent authority to decide.

The implications of the two footnotes are that it is acceptable to get higher ELVs (in the permit) than the BAT-AEL upper levels in cases where biomass is used. Liquid fuels which would allow higher ELVs than the BAT-AELs are described as those "originating from vegetable matter (e.g. turpentine, methanol and tall-oil) including those obtained as by-products of the pulping process". As the three by-products mentioned are only examples, there may be other by-products which merit a higher emission limit value (ELV) in the permit.

An example of other gaseous by-products (bit non-condensable gases) is gasified bark.

BAT 27 – Dust emissions from lime kilns

In order to reduce dust emissions from a lime kiln, BAT is to use an electrostatic precipitator (ESP) or a combination of ESP and wet scrubber.

In table 9, the BAT-AELs are expressed as yearly averages both as concentration and in kg/ADt. There is a footnote included similar to the one for dust for recovery boilers.

Furthermore, the same remarks expressed for BAT 23 also apply to BAT 27.

BAT 28 – Emissions from burners for strong odorous gases

In order to reduce SO2 emissions from the incineration of strong odorous gases in a dedicated TRS burner, BAT is to use an alkaline SO2 scrubber.

In table 10, the BAT-AELs provided are presented as yearly averages in concentration (mg/Nm^3) both for SO_2 and TRS-S emissions. The yearly average in relative load (kg/ADt) is however only presented as the sum of SO_2-S and TRS-S. There is no separate BAT-AEL for TRS-S, in contrast to emissions from lime kilns. Therefore, an operator may expect the competent authority to require adherence to the BAT-AEL concentration values for TRS-S in case a mill opts for the BAT-AEL to be presented as load value (kg/ADt).

The footnote in table 10 suggests that the BAT-AEL in relative load (kg/ADt) "is based on a gas flow in the range of 100-200 Nm^3/ADt". The flow can be several times higher than this range. The gas flow in a dedicated TRS-burner depends on amount and type of fuel used.

The lower kg/ADt BAT level of 0,002 kg S/ADt resembles a flow of about 200 Nm^3/ADt multiplied with the lower BAT-AEL concentration levels. On the other hand, the upper level of 0,05 kg/ADt matches a flow of 800 Nm^3/ADt. This means that what is said in the footnote is true for the lower end but not for the more important higher end value. The interpretation of the footnote would only be clear if the upper BAT-AEL was 0,013 kg/ADt (200 Nm^3/ADt times 65 mg/Nm^3). If so, a possible interpretation is that a higher flow than 200 Nm^3/ADt would result in a corresponding higher kg/ADt value. While this may be a correct interpretation, it lacks logic as the 0,05 load value already resembles 800 Nm^3/ADt.

BAT 29 – Emissions of NOx from burners for strong odorous gases

In order to reduce NOx emissions from the incineration of strong odorous gases in a dedicated TRS burner, BAT is to use one or a combination of the [two] techniques given.

In table 11, there are two alternative sets of BAT-AELs, both as yearly averages. The load (kg/ADt) figure corresponds to a gas flow of approximately 200 Nm^3/ADt. This means that at higher flows the load values are stricter than the concentration values.

The footnote is quite straight forward giving the possibility for the competent authorities to double the BAT-AEL upper levels if staged incineration is not possible.

BAT 30 – Waste generation

In order to prevent waste generation and minimise the amount of solid waste to be disposed of, BAT is to recycle dust from black liquor recovery boiler ESPs to the process.

There are no BAT-AELs for waste in the BAT conclusions for the pulp and paper sector. This BAT for kraft pulping processes is without BAT-AELs.

This BAT is somewhat superfluous as recycling of dust from recovery boilers' ESPs is a fundamental and necessary part of the kraft pulping process.

The competent authority shall in a permitting situation consider all BAT conclusions without AELs as a "reference" when setting permit conditions for an operator, including the general ones. The same goes for situations where the competent authority reconsiders the existing permit conditions during the four-year 'consideration' period following the official publication by the European Commission of the BAT conclusions.

Under the applicability section, it is stated that recirculation may be limited due to non-process elements (NPEs) in the dust. This is true as bleeding out of recovery boiler dust dissolved in water is a normal procedure when the content of non-process elements is too high.

BAT 31 – Energy consumption

In order to reduce thermal energy consumption (steam), maximise the benefit of energy carriers used, and to reduce the consumption of electricity, BAT is to apply a combination of the [seventeen] techniques given.

In the list, there are seventeen different best available techniques listed. These are qualified as BATs by using somewhat vague expressions like 'high', 'effective', 'appropriate', 'optimise', 'ensuring' and 'proper'. Most likely, mills already fulfil requirements according the list.

Due to the fact that energy data collection was incomplete and energy consumption is already included in the Energy Efficiency Directive (EED) and in EU Emission Trading Scheme (ES), there is no BAT-AEPL presented. Chapter 3.3.27 of the BREF-PP provides

energy consumption data generally achievable at mills with well-designed processes and used as a comparison when assessing the performance of a mill and when discussing possible measures with the national authority.

BAT 32 – Energy efficiency

In order to increase the efficiency of power generation, BAT is to apply a combination of the [seven] techniques given.

A number of more concrete measures are listed together with words like “high” and “as low as technically possible”. Energy data is presented in chapter 3.3.27 (see also BAT 31).

3. BAT Conclusions for the Sulphite Pulping Process

BAT conclusions for sulphite pulping processes are BAT 33 to 39. The BAT-AELs given are for the pulping process only.

Integrated mills must therefore also take the BAT conclusions for paper making into account.

BAT 33 – Waste water and emissions to water

In order to prevent and reduce emissions of pollutants into receiving waters from the whole mill, BAT is to use a suitable combination of the [eleven] techniques specified in BAT 13, BAT 14, BAT 15 and BAT 16 and of the techniques given.

In this BAT, not only are the technologies listed in the table but also some general BATs.

The BAT-AELs given are applicable for the direct waste water discharge to receiving waters from a pulp mill manufacturing bleached sulphite and magnefite paper grade pulp (table 12), and from a sulphite pulp mill manufacturing NSSC pulp (table 13). The BAT-AELs are not applicable to dissolving pulps and specialty pulps for chemical applications.

It is explicitly noted that the reference waste water flow for sulphite mills can be found elsewhere (in BAT 5).

Table 12 has BAT-AELs for both bleached sulphite paper grade pulps and magnefite paper grade pulps. When footnote 2 says that the BAT-AELs do not apply to “natural greaseproof pulp mills”, it should probably to be understood as “virgin greaseproof pulp mills”.

Footnote 3 states that the COD and total phosphorous (tot-P) values do not apply to eucalyptus-based market pulps.

The BAT-AELs for AOX emission are in concentration (mg/l) contrary to the ones for kraft pulping which are in relative load (kg/ADt).

In table 13 we find the BAT-AELs for NSSC-pulping. These are quite straight forward.

A sentence is introduced after the tables informing readers that “the BOD concentration in treated effluents is expected to be low (around 25 mg/l as a 24 hour composite sample)”. The BOD concentration provided is not considered a BAT-AEL but an *indicative* value with the purpose of providing guidance to the competent authorities with information on how a well-designed and operated biological treatment plant can perform when it comes to easily degradable organic matter. The indicative value is not legally binding according to IED.

BAT 34 – Measures to reduce SO_2 emissions

In order to prevent and reduce SO2 emissions, BAT is to collect all highly concentrated SO2-gas streams from acid liquor production, digesters, diffusers, or blow tanks and to recover the sulphur components.

This BAT lists a number of technologies. Such a BAT should be used as a reference by the competent authority like the general BAT 1 to 18.

Many sulphite pulp mills producing NSSC practice cross-recovery with a neighbouring kraft pulp recovery boiler. However, this BAT provides no information whether, or how, the air emissions from a sulphite pulp mill producing NSSC are regulated through these BAT conclusions.

The mill will have to discuss with the competent authority which BAT-AELs, if any, apply to a kraft recovery boiler used for cross-recovery. The most likely interpretation is that no requirements follow the BAT conclusions. A possible alternative in such a case is offered in the last paragraph IED Article 14.5, which in essence says: where the BAT conclusions do not have BAT-AELs, the competent authority shall ensure a level of environmental protection equivalent to the techniques described in the BAT conclusions.

BAT 35 – Measures to reduce diffuse S-emissions

In order to prevent and reduce diffuse sulphur-containing and odorous emissions from washing, screening, and evaporators, BAT is to collect these weak gases and to apply one of the [two] techniques given below.

The problem with diffuse sulphur-containing emissions is much less pronounced compared to the problems identified at kraft pulping processes. The costs of taking measures should be balanced against the benefits.

The use of one of two technologies listed is considered BAT. Such a BAT conclusion without any AEL values should be used as reference in a permitting situation by the competent authority together with other relevant BATs, including the general BATs 1 to 18. The same is true when the competent authority reconsiders the existing permit conditions during the four year period following the official publication of the new BAT conclusions.

Many sulphite pulp mills producing NSSC practice cross-recovery with a neighbouring kraft pulp recovery boiler. However, this BAT gives no information whether, or how, the air emissions from a sulphite pulp mill producing NSSC are regulated through these BAT conclusions.

The mill will have to discuss with the competent authority which BAT-AELs, if any, apply to a kraft recovery boiler used for cross-recovery. The most likely interpretation is that no requirements follow the BAT conclusions. A possible alternative in such a case is offered in the last paragraph IED Article 14.5, which in essence says: where the BAT conclusions do not have BAT-AELs, the competent authority shall ensure a level of environmental protection equivalent to the techniques described in the BAT conclusions.

BAT 36 – Reduction of NO_X emissions from recovery boilers

In order to reduce NOx emissions from a recovery boiler, BAT is to use an optimised firing system including one or a combination of the [three] techniques given.

The list of technologies is quite straight forward.

Table 14 has one set of BAT-AELs as daily averages in mg/Nm^3 at 5% O_2 and one as yearly averages also as mg/Nm^3 at 5 % O_2. The difference between them is about 30%.

In addition to the NO_X levels, there is a BAT-AEL for NH_3 slip when SNCR is used.

Although not officially stated, the European Commission considers that both BAT-AELs would apply.

BAT 37 – Reduction of dust and SO_2 emissions from recovery boilers

In order to reduce dust and SO2 emissions from a recovery boiler, BAT is to use one of the [two] techniques given below and to limit 'acid operation' of the scrubbers to the minimum required to ensure their proper functioning.

The measures listed to reduce SO_2 emissions are also a part of the process. There are two different types of scrubbers mentioned as BAT.

Table 15 with BAT-AELs for SO_2 emissions are given as concentration (mg/Nm^3) expressed both as daily and yearly averages.

For dust emissions, there is only one BAT-AEL value which is presented as an average over the sampling period. By definition, this means the average value of three consecutive measurements of at least 30 minutes each. There is no information provided on how often such a measurement should be performed or if the averaging should be for sets of three as rolling averages. This will have to be discussed between the mill and the competent authority.

Footnote 1 says that for mills using more than 25% potassium rich hardwood (e.g. beech?), higher dust emissions of up to 30 mg/Nm^3 may occur. It should be understood that the competent authority can accept a BAT-AEL upper level of 30 mg/Nm^3 in such cases.

The other four footnotes give a number of detailed exceptions from the BAT-AELs.

A BAT associated environmental performance level (BAT-AEPL) is presented below the table. The BAT-AEPL is for the duration of an acid operation. The interpretation of the BAT-AEPL should be discussed with the competent authority. The competent authority may use the associated environmental performance level as reference when deciding on measures relating to conditions other than normal operating conditions, see also IED Article 14.1.f.

BAT 38 – Energy consumption

In order to reduce thermal energy consumption (steam), maximise the benefit of the energy carriers used and to reduce the consumption of electricity, BAT is to use a combination of the [eleven] techniques given.

The BAT is similar to the equivalent one for kraft pulping (BAT 31). Therefore, the same remark applies to this BAT.

Reported energy data from existing sulphite pulp mills can be found in the BREF-PP document chapter 4.2.2.3. Such data can be used as benchmarks when assessing the performance of a mill and discussing possible measures with the competent authority.

BAT 39 – Energy efficiency

In order to increase the efficiency of power generation, BAT is to use a combination of the [six] techniques given.

The BAT is similar to the equivalent one for kraft pulping (BAT 32). Therefore, the same remark applies to this BAT.

Reported energy data from existing sulphite pulp mills can be found in the BREF-PP document chapter 4.2.2.3.

4. BAT Conclusions for Mechanical Pulping

BAT conclusions for mechanical pulping and chemi-mechanical pulping are BATs 40 and 41. If the production at a mechanical or a chemi-mechanical pulp mill includes paper production, BAT 49, 51, 52c and 53 for paper production also applies.

The BAT-AELs applying to integrated mechanical pulping production refer to specific emissions per produced paper (kg emissions per tonne of paper). These BAT-AELs also apply to the production of pulp only, which is relevant for those (rare) cases where mechanical pulps are sold on the market.

The BAT-AELs for chemi-mechanical pulping only refer to pulp production.

BAT 40 – Waste water and emissions to water

In order to reduce fresh water use, waste water flow, and the pollution load, BAT is to use a suitable combination of the techniques specified in BAT 13, BAT 14, BAT 15 and BAT 16 and of the [six] techniques given.

As for BAT 19 and 33, references are made to some general BATs (BAT13 to 16). The reason for this may be to remind operators and authorities to consider these as well.

The BAT-AELs in specific load (kg/t) in table 16 are valid for the integrated production of paper and board from mechanical pulp produced on site. The values should however also be used for any non-integrated production of mechanical pulp.

Footnote 1 says that in the case of highly bleached pulp the BAT-AEL upper level for COD emissions is up to 8 kg/t. “Highly bleached” should be understood as pulp bleached using hydrogen peroxide. The footnote (with the value of 8 kg/tonne) only applies if more than 70% of the fibres in the final paper originate from highly bleached pulp.

If non-biodegradable chelating agents are used, footnote 2 offers the possibility to accept higher emission limit values for nitrogen (N) than those following from the BAT-AELs (assessed on a case-by-case basis by the competent authority).

There are discussions as to what extent the cheating agent EDTA, for example, is biodegradable. Some claim that EDTA under certain circumstances can be degraded in waste water treatment plants. As long as conclusive evidence of biodegradability is not available, footnote 2 can probably be used. Aerobic degradation data would normally be available for such agents in the safety data sheets provided, however, it is fair to say that anaerobic degradation data is often missing in the data safety sheets (SDSs).

The BAT-AELs for non-integrated CTMP and CMP production are generally higher than for integrated production of paper from mechanical pulps (Table 17).

Calculation of BAT-AELs

The calculation of BAT-AELs for a certain production is not always straight forward, e.g. when not only mechanical pulps are used to produce the paper but also other pulp grades.

Below is an example of production of printing paper with integrated TMP and DIP production using also purchased kraft pulp. The fibre content is 33% purchased kraft pulp, 34% TMP pulp and 33 % DIP pulp both produced at the mill site.

The TMP and DIP BAT-AELs are given per tonne of paper in the BAT conclusions while the BAT-AELs for kraft pulp are only for the pulp production. For the purchased kraft pulp faction, one possibility is to use the BAT-AELs for non-integrated paper production. The calculation of the BAT-AEL upper level for COD for this production would then be:

Example 1: 0,33 x 1,5 + 0,34 x 4,5 + 0,33 x 3,0 = max 3,0 kg COD/t paper

[Sources, in order: table 20, table 16 and table 19]

If the kraft pulp had been produced onsite, the calculation would have been:

Example 2: 0,33 x (1,5+20) + 0,34 x 4,5 + 0,33 x 3,0 = max 9,6 kg COD/t paper

[Sources, in order: table 20 and table 1, table 16 and table 19]

Another way forward is to take only the integrated production of TMP and DIP pulp into account and not the paper production load. In this example, the two pulp productions are divided approximately 50/50. The calculation of the BAT-AEL would then be:

Example 3: 0,5 x 4,5 + 0,5 x 3,0 = max 3,75 kg COD/t paper

[Sources, in order: Table 16 and Table 19]

A reasonable interpretation of footnote 1 of table 16 in the BAT conclusions is in both cases that 8 kg of COD/t should be used for the TMP if it is “highly bleached”.

Clearly, there are issues with both calculation methods. For integrated mechanical paper and print paper production, in examples 1 and 2, there is no common view about how BAT-AELs for non-integrated papermaking part of the production can be used. In example 3, which may be favourable, it is problematic to exclude the calculation of the non-integrated papermaking part for mills buying large amounts of chemical pulp. In such situations, the data supplied for the BREF review from paper mills integrated to mechanical pulping may contain an effluent load of mills with paper making, mechanical pulp production and purchased chemical pulp.

It should be noted that it is difficult to firmly advise also due to conflicting interpretation among EU member states and the legal text being in conflict with the spirit of the BAT conclusions. A solution to these concerns should be worked out at mill level with the competent authority.

BAT 41 – energy consumption and efficiency

In order to reduce the consumption of thermal and electrical energy, BAT is to use a combination of the [six] techniques given below.

This BAT only consists of a list of technologies which can be used to reduce the consumption of thermal and electrical energy. Typical ranges of energy consumption and energy recovery rates and energy balances can be found in chapter 5.2.2.7 of the BREF-PP document.

5. BAT Conclusions for Processing Paper for Recycling

BAT conclusions for processing paper for recycling are BAT 42 to 46.

The BAT conclusions presented apply to both integrated and non-integrated recycled fibres (RCF) of existing pulp mills. The BAT-AELs are given as relative load (kg/t) which for non-integrated mills should refer to tonne of pulp and for integrated mills to tonne of paper.

If the production at a recycled fibre (RCF) pulp mill includes paper production, the BATs for paper production (BAT 49, BAT 51, BAT 52c and BAT 53) in apply addition to BATs 42 to 46.

BAT 42 – Materials management

In order to prevent the contamination of soil and groundwater or to reduce the risk thereof and in order to reduce wind drift of paper for recycling and diffuse dust emissions from the paper for recycling yard, BAT is to use one or a combination of the [five] techniques given.

Five techniques are listed aiming at reducing the risk of contamination of soil and groundwater, wind drift of recycled paper, and dust from the recycling yard. As always, it is important to take the applicability descriptions into account.

BAT 43 – Water use, waste water flow, pollution load

In order to reduce fresh water use, waste water flow, and the pollution load, BAT is to use a combination of the [four] techniques given below.

This BAT lists four measures which can be applied in order to reduce fresh water use, waste water flow, and the pollution load.

BAT 44 – Water circuit closure and increased recycling of process water

In order to maintain advanced water circuit closure in mills processing paper for recycling and to avoid possible negative effects from the increased recycling of process water, BAT is to use one or a combination of the [three] techniques given below.

This BAT is only directed towards mills with “advanced” water circuit closure (presuming board and corrugating medium mills). Three techniques are listed. A likely understanding is that mills with a waste water flow at, or below, the lower end of the BAT associated waste water flow in BAT 5 have “advanced” water circuit closure.

BAT 45 – Pollution load of waste water from the whole mill

In order to prevent and reduce the pollution load of waste water into receiving waters from the whole mill, BAT is to use a suitable combination of the techniques specified in BAT 13, BAT 14, BAT 15, BAT 16, BAT 43 and BAT 44.

In this BAT are two tables with the BAT-AEL values presented: Table 18 without deinking, table 19 with deinking. Reference is made to some of general BATs (BAT 13, 14 and 15) and to BAT 43 and 44. The general BAT conclusions always apply to all mills as appropriate.

Table 18 is for recycled fibre (RCF) mills without deinking the pulp. As mentioned in the introduction of this section, the BAT-AELs apply to both integrated and non-integrated mills.

Footnote 2 says for emissions of total suspended solids (TSS) from existing waste water treatment plants, the BAT-AEL upper level may be more than twice (2x) as high compared to the BAT-AEL given in the table. The reason given in the footnote is the “continuous decline [over time] in the quality of paper for recycling and, at the same time, the difficulty of continuously upgrading the effluent plant”.

The AOX emission level only applies when wet strength paper is produced (when chlorine containing organic chemicals like epi-chlorhydrine is used).

Table 19 is for recycled fibre (RCF) mills practising deinking. The values are, of course, generally higher than those without deinking. The BAT-AELs for tissue mills are even higher. If the integrated RCF mill also uses virgin pulp, AELs for papermaking are also applicable in proportion to the virgin fibre used.

Under both tables, there is a sentence introduced informing that “the BOD concentration in treated effluents is expected to be low (around 25 mg/l as a 24 hour composite sample)”. The BOD concentration provided is however not a BAT-AEL but an indicative value with the purpose to provide guidance to the competent authorities with information on how a well-designed and operated biological treatment plant will perform when it comes to easily degradable organic matter. The indicative values are not legally binding.

BAT 46 – Energy consumption and efficiency

BAT is to reduce electrical energy consumption within RCF processing paper mills by using a combination of the [three] techniques given below.

Three BATs are listed and all have their applicability restricted to new plants and major refurbishments.

6. BAT Conclusions for Papermaking

BAT conclusions for papermaking and related processes are BATs 49 to 53.

The BAT conclusions in this section apply to all non-integrated paper mills and board mills and to the paper and board production part at integrated kraft, sulphite, CTMP and CMP mills. However, these BAT conclusions do not apply to integrated mechanical pulp and integrated mills processing paper for recycling.

BAT 49, BAT 51, BAT 52c and BAT 53 apply to all integrated pulp and paper mills. For integrated kraft, sulphite, CTMP and CMP pulp and paper mills, the process-specific BATs for pulping also apply in addition to the BAT conclusions in this section (BAT 49 to BAT 53).

The terminology “board” is used instead of “cardboard” which is used in IED Annex I.

BAT 47 – Reduction of the generation of waste water

In order to reduce the generation of waste water, BAT is to use a combination of the [four] techniques given.

The use of a combination of four listed techniques is considered the BAT.

BAT 48 – Water use and emissions to water from specialty paper mills

In order to reduce fresh water use and emissions to water from speciality paper mills, BAT is to use a combination of the [six] techniques given.

The six techniques listed aim at coping with the many changes of paper grades which normally occur at specialty paper mills.

For examples of speciality mills, see the BREF-PP document.

BAT 49 – Reduction of emission load colours and binders

In order to reduce emission loads of coating colours and binders which can disturb the biological waste water treatment plant, BAT is to use [one of the two] techniques given.

The two techniques listed deal with pre-treatment, recovery, and recycling.

BAT 50 – Prevent and reduce the pollution load of waste water

In order to prevent and reduce the pollution load of waste water into receiving waters from the whole mill, BAT is to use a suitable combination of the techniques specified in BAT 13, BAT 14, BAT 15, BAT 47, BAT 48 and BAT 49.

Reference is made to some of the general BATs (BAT 13, BAT 14 and BAT 15) and to BATs 47 to 49. As always, the general BAT conclusions apply to all mills as appropriate.

BAT-associated emission levels for the direct waste water discharge to receiving waters from a non-integrated paper and board mill (excluding speciality paper) are presented in Table 20.

Footnote 1 says that the upper end of the BAT-AEL range for COD emissions refers to mills manufacturing graphic paper using starch in a coating process. This footnote has, however, no impact on the requirements following from the BAT-AELs for manufacturing such papers. With the intention of noting where high starch is used in the coating process, rather than the main paper making itself, the upper level of 1.5 kg COD kg/t is based on the minimum requirements set in the IED. The footnote can, however, give rise to discussion with the competent authority on the understanding of which BAT-AEL upper to use for graphic paper manufacturing not using starch. Some competent authorities may argue that the permit value should be lower than 1.5 kg/t. In this context, note that uncoated copying, printing, and writing paper also contain starch.

A sentence with expected BOD concentration appears below table 20. The BOD concentration provided is, however, not a BAT-AEL and thus does not have the strict legal effect these have. It is rather information on how a well-designed and operated biological treatment plant will perform when it comes to easily degradable organic matter.

Table 21 provides BAT-associated emission levels for the direct waste water discharge to receiving waters from a non-integrated speciality paper mill. The BAT-AELs of this table for speciality paper are, of course, higher than the ones in table 20 for other paper mills.

Footnote 1 states that speciality paper mills with certain special characteristics may be given higher permit emission values than the upper end BAT-AEL. This is exemplified by more than five grade changes per day or producing light weight specialty paper of 30 g/m^2 or less.

Footnote 2 says that the upper end of the BAT-AEL range for COD emissions refers to mills producing highly comminuted paper which requires intensive refining and to mills with frequent changes of paper grade (e.g. one or two changes per day). As is the case for table 20, such a footnote does not change anything for the mills in question regarding the minimum requirements following the upper BAT-AEL. However, it may send a message to the competent authority that the upper end of the range could be lower for other mills.

Table 21 contain no ‘standardised’ sentence on BOD concentration for speciality paper.

BAT 51 – Emissions to air

In order to reduce VOC emissions from off-line or on-line coaters, BAT is to choose coating colour recipes (compositions) that reduce VOC emissions.

The statement is that it is BAT to choose coating colours with low VOC content.

BAT 52 – Waste generation

In order to minimise the amount of solid waste to be disposed of, BAT is to prevent waste generation and to carry out recycling operations by the use of a combination of the [four] techniques given below (see general BAT 20).

This BAT lists four techniques which, in addition to the general BAT 20 conclusion, are regarded as being BATs for the prevention of waste regeneration and for carrying out recycling of paper.

NB. We have identified a mistake in the official version of the BAT conclusions: BAT 52 states a link to techniques “see general BAT 20”. **This should be BAT 12!**

BAT 53 – Energy consumption

In order to reduce the consumption of thermal and electrical energy, BAT is to use a combination of the [nine teen] techniques given.

This BAT includes a long list of potential techniques but no BAT-AELs or BAT-AEPLs are set.

7. Questions & Answers

The frequently asked questions and answers (FAQ) below are based on a panellist discussion with pulp and paper industry experts on the new BAT conclusion for pulp, paper and board production held at a BREF-PP workshop in Brussels on 23 September 2014.

Before we continue on the FAQ – first a word from a practitioner in the field:

Key things to bear in mind while assessing the new BAT conclusions; it is important to:

- Address the spirit of each BAT in any gap analysis, not each and every technique. It may be possible to evidence other techniques which achieve the same intended outcome of the BAT conclusion;
- Again in a gap analysis, if a BAT conclusion is not applicable state it is so and why, then move on;
- Remember compliance date is 30 September 2018, not tomorrow! If a gap analysis is done early this allows for a plan to achieve compliance (if necessary) to be agreed with competent authorities and progress made over time rather than at the last. It is important to understand such things e.g. where the COD or nutrient levels come from before, you can look at managing the final emissions balance. This all takes time.
- Beware of "mission creep"! In our experience the competent authority develops a habit of trying to get more information or commitments then strictly required within this BAT implementation process by citing this is "BAT" or that is "BAT"; for example:
    - Wanting to see targets on water and waste minimisation specified in the objectives and targets of the environmental management system and to assess the effectiveness of certified environmental management system themselves (when they are not qualified to do so),
    - Requiring water minimisation plan when approaching the upper BAT-AEPL for waste water flow,
    - Wanting detailed focus on waste minimisation plans; separation of waste streams to facilitate fibre recovery based on simple assumptions for fibre reuse and not taking economics into accounts.

General all BATs

Q1: Local authorities may aim for implementation of all BAT techniques in the field, is this allowed?

A1: It is not the aim of IED to request implementation of all listed BAT techniques. But local authorities can always go further than minimum which is "one or a combination of following techniques and alternative technique can also be proposed". IED is a minimum directive, thus a starting point for discussion with the authorities. Note that some requirements are compulsory, some are optional, thus discuss different alternatives with the authorities.

Q2: Do I have to install all BAT mentioned in the document to control a certain parameter, e.g. all BAT 19? And can they prescribe a specific technique, e.g. TCF bleaching)?

A2: The techniques listed are neither exhaustive nor prescriptive. Other techniques can be used. In combination or alone. Operators' can select the suitable combination of techniques

that lead to the equivalent level of protection. The operator could have some difficulties justifying not using the generally applicable BATs. An economical assessment is the way to justify in same cases. Advise to read the whole BREF-PP, not only the BAT conclusions.

Best in all?

Q3: Process emissions (S and NOx emissions) are to some extent complementary but my permitting authority is asking the best in all (recovery boiler, lime kiln, dedicated burner); is this in line with IED? Permitting authority and operators are "lost" with so many footnotes.

A3: There are no "global" process emission levels. However, the BAT-AEL ranges, helped with the footnotes, reflect the different emission levels and operational conditions. Footnotes have important and relevant information on conditions and emission level that must be taken in to account by permitting authorities and operators to define emission levels.

It will be very difficult discussion with the authorities, to convince using total S. In the BAT conclusions, each emission got a BAT-AEL request. It is important for operators to know specific flue gas flow in different emission situations!

Specific and concentration

Q4: Can I have a permit with both specific and concentration emission limits?

A4: They are to be seen as equivalent alternatives for the same averaging period, i.e. use one of them, not both.

For recovery boiler sulphur emissions emission levels can be set on concentration for daily and specific load for yearly average. Agree with your authority. Clearly, it should not be both.

General multi-product mills

Q5: How should permit be set when I have a multi-product pulp and paper mill? How should my permit be set if the mill uses 'softwood' and 'hardwood' raw material?

A5: The method given is perhaps not crystal clear. The different BAT-AELs need to be combined according to a mixing rule based on their additive shares of discharge.

BAT 3 & BAT 10

Monitoring of chelating agents

Q6: The authority has required monitoring once a month emissions of chelating agents (EDTA and DTPA) to water; is this too frequent for chelating agents?

A6: Concentration of EDTA and DTPA from peroxide bleaching in waste waters is usually low, and in most cases near detection limit. Analysing EDTA and DTPA in the official laboratories is expensive. Therefore only periodic measurements (less frequently than once a month) are needed. The use of EDTA and DTPA is regulated under REACH and we do not see any need to regulate their use further under IED as long as REACH regulations are met. It is necessary that the mill and the authority discuss what the most appropriate monitoring frequency for chelating agents is; probably more often than 1-2 times/month is needed.

BAT 4

Collecting run-off water

Q7: According to the current permit the mill has to collect all contaminated run-off waters from the wood yard and separate out suspended solids effluent before biological treatment. Is it possible to manage with this demand?

A7: It is said in BAT 4 that the applicability of this technique may be restricted by the degree of contamination of run-off water (low concentration) and/or the size of the waste water treatment plant (large volumes). It is not possible to take all run-off waters from the big wood yards to the biological treatment plant because the hydraulic capacity of the plant will be exceeded especially during heavy rains. Waste waters will dilute because of low concentration of run-off waters reducing the purification efficiency.

If you pave, you have storm water tanks (e.g. obligation in the United States). If all water is collected, efficiency will go down. Result: water load from the mill will increase.

Paving of wood yard area

Q8: The authority has required paving all the wood yard areas. Is this possible in practice?

A8: It is said in BAT 4 that the applicability of this technique may be restricted due to the size of wood yard and storage area. The wood yards are very large areas and the paving of all these yards is very expensive. In practice it is not possible to store all logs in the paved areas, taking also into consideration that log storage is normally temporary and with normal rotation between different areas. Paving of the storage area of chips is possible when the size of the storage area is reasonable.

Pave where reasonable, e.g. when permanent wood yard, but no pavement for log storage as it will lead to huge amount of storm water.

BAT 5

Q9: Regulating water use. The authority has set limit value for water discharge of 40 m^3/ADt. Is this really what is meant by IED/BREF/BAT?

A9: The table lists BAT-AEPL (BAT associated environmental performance levels) which is not BAT-AEL in the sense of IED. This word of warning was actually included in the final drafts by the European Commission. Values are included as references to allow evaluation of level of concentrations generally occurring in the sector. The important value is the (real) concentration of the pollutant (in case this is problematic), not the restricting the water use.

Furthermore, it is necessary to keep the coherence between specific emissions values, concentrations and water use as they are mathematically connected.

BAT-AEPLs are reference values, it will be difficult to use them, but since they are there the competent authorities will use them. Note that CEPI advocated specific load values, some EU member states due to national legislation prefer concentration values.

Q10: Water and waste water management. “The effluent flow of our mill is 35m^3/ton: can the authorities control this with reference to the new BAT conclusions?”

A10: The water consumptions mentioned in the BAT 5 are reference values. They are not BAT-AEL and are not meant to be the basis for limit values, but local authorities can decide to do this beyond EID requirements. They might also request to assess the feasibility of techniques listed in BAT 43, 44 and 47.

BAT 9

Continuous measurement of dust

Q11: The authority has demanded the kraft pulp mill to measure dust emissions to air continuously from the recovery boiler whose flue gases are treated after the electrostatic precipitators in the scrubber. Is this demand reasonable?

A11: The flue gases after the scrubber are wet and the continuous measurement for dust in these circumstances is impossible in practice. When the flue gases of the recovery boiler are dry (no scrubber), the continuous measurement for dust is possible but still quite uncommon.

BAT 10

Analysis methods

Q12: The authority demands that all the analysis methods used for analyzing emissions to water must be ISO, national or other international standards. Is there any exception to this demand?

A12: Rapid test methods can also be used. The results of rapid tests should be checked regularly against EN standards or, if EN standards are not available, against ISO, national or other international standards which ensure the provision of data of an equivalent scientific quality. These rapid test methods reduce the time needed to analyze waste water samples and they also lower costs of the laboratory.

This monitoring can be used as legal reporting if comparison with EN standard goes in the right direction. EN standards are preferred by many.

Sampling

Q13: “We have a permit that allows grab sampling: can this stay?”

A13: You will need to prove that your flow and pollution rate is not varying significantly.

If the process is not stable enough, also the outflow is not stable so difficult to defend grab sampling. BAT 14 and BAT 16 contains no obligation but a starting point for discussion with the authorities. Different countries may have different approaches, where e.g. UK has a risk based approach to monitoring.

BAT 14

Waste water treatment

Q14: The authority has required the paper mill to build the biological treatment in addition to the existing primary treatment to lower waste water discharges. Are there any other possibilities to reduce waste water load from the paper mill whose biological load after the

primary treatment is low? Competent authorities in the northern Europe ask for the lowest BAT-AEL level, how to get there?

A14: 1) A paper mill has the freedom to decide which combination of internal preventive measures and external end-of-pipe measures it needs in order to meet a BAT-AEL for discharges to water. 2) The chemical treatment is one possibility for e.g. some paper mills producing specialty paper and also uncoated fine paper. 3) Solids, phosphorous and nitrogen load after chemical treatment is clearly lower than the upper level of BAT-AELs for these paper grades. 4) In the chemical treatment no bio-sludge is formed which is positive.

Ask the authorities to justify their position. Remember IED is minimum requirements. Maybe the county has national legislation. Competent authorities formally need to justify their position/decision and the company could in any case challenge it.

BAT 20

Monitoring of weak gases

Q15: How many and how frequent should I monitor residual weak gases?

A15: It is not defined in the BAT conclusions Operators and authorities should work together to identify “weak gases” exhausts that are significant for the release of S compounds (suggestion: based on an initial assessment) and establish a reasonable frequency.

Advice mill operators to map the emission points and demonstrate this for the competent authority demonstrating compliance.

BAT 21

Sulphur emissions recovery boilers

Q16: Could daily average for SO2 and TRS emission be set in concentration and yearly average be set in specific for total gaseous S?

A16: There is no indication that they cannot, but on the other hand there is no reason to have this combination in the permit as a condition.

BAT 23 & BAT 27

End of operational life

Q17: ESP is approaching the end of its operational life but authorities are asking for emission limit bellow the BAT-AEL for existing equipment? Should it be obliged to build a new one?

A17: A footnote was introduced safeguarding the economic operational lifetime of the investment, but at the same time it was set high requirements for new equipment guarantying high environmental standard in the moments of new investment decisions.

On the last part of the question (should it be obliged to build a new one); difficult question. The idea is to use the technology when still operating.

BAT 26

Lime kilns

Q18: I burn both liquid and gaseous fuels in the lime kiln, what should be my emission limit values for NOx?

A18: The emission limit value to be set must consider the weight contribution of the different types of fuel.

BAT 31

Energy efficiency

Q19: Can I have an energy consumption level on my permit?

A19: No BAT-AEL for energy consumption; these are only a set of BAT's. Competent authorities can ask for more efficiency, it depends on the national legislation. All figures in the BREF-PP are based on net production. Some operators may consider gross production (include everything) to be more relevant, but this is not the case in order to legally comply.

Note that in the end of 2015 (expected), energy efficiency directive (EED) by law will become valid for all mills.

BAT 33

Waste water sulphite pulping

Q20: COD BATs are < 30 kg/ADt (sulfite), < 35 kg/ADt (magnefite), < 11 kg/ADt (NSSC). These are BAT-AELs for the direct waste water discharge to receiving waters. This BAT specify this is not applicable to greaseproof and eucalyptus based market pulp and ammonium based NSSC mills. Authorities demand short term data. Is this acceptable?

A20: Yearly average, but monitoring is daily (sulfite paper grade mostly below) (problem for magnefite!). Techniques with very limited applicability to existing boilers defined as BAT. Only pH adjustment of weak liquor and anaerobic treatment of the condensates generally applicable. BOD levels only mentioned as text. Short term data due testing method with 24 hours, composite sample difficult. Even small changes in operation will lead to new requirements set by the competent authority.

BAT 36

NOx recovery boilers sulphite pulping

Q21: BAT for NO_X < 350 [mg/Nm³] as daily average and < 270 [mg/Nm³] as yearly average. Shall we optimize the firing system or apply one of the suggested techniques?

A21: Only optimization by controlling firing conditions is feasibly. Other techniques have very limited applicability. For ammonium based mills, higher emission levels of NOx may occur (< 580 [mg/Nm³]).

BAT 37

SOx recovery boilers / sulphite pulping

Q22: The higher value of dust emission for mills using ≥ 25% hardwood dust limit is 30mg/Nm³. These are not applicable under acid operation. BAT-AEPL is around 240 hours per year for the scrubbers and less than 24 h/month for the last (monosulphite) scrubber.

A22: It does not apply to recovery boilers operated permanently under acidic conditions (using sulfite liquor as washing medium). Limit values are <400 (daily)/<350 (yearly) [mg/Nm³] for existing multistage venturi scrubbers may occur.

BAT 40

Integrated and non-integrated production

Q23: How is “Integrated production” defined in BREF? How is “non-integrated production” defined in the BAT conclusions?

A23: Both pulp and paper/board are produced at the same site. The pulp is not normally dried before paper/board manufacture, either: (a) production of market pulp (for sale) in mills that do not operate paper machines, **or** (b) production of paper/board using **only** pulp produced in other plants (market pulp).

Paper mill using integrated mechanical pulp and purchased chemical pulp shall totally be considered as integrated production.

BATAELs from integrated paper and board

Q24 How should BAT-AELs given in Table 16 (e.g. COD 0.9 – 4.5 kg/t) be applied to paper mill which is integrated to mechanical pulp mill and uses additionally purchased chemical pulp (e.g. fibre furnish of paper 50 % TMP and 50 % purchased chemical pulp)?

A24: Higher BAT level for COD is valid for this paper mill, i.e. 4.5 kg/t. It is not meant, that BAT level for COD could be calculated by using a combination of integrated production and non-integrated production: 0.5x4.5 + 0.5x1.5 = 3.0 kg/t is not correct, because 1.5 kg/t paper is valid for non-integrated paper mills or paper making part of integrated kraft, sulphite, CTMP and CMP mills.

BAT 42

Materials management

Q25: RCF mill that stores loose paper for recycling outside and that receives often complaints for litter. RCF mill’s typically respond: “we store our paper for recycling outside on bare ground with approval from local authorities”.

A25: This BAT requires that one or a combination of techniques described has to be applied. It is most likely that this mill will be forced to foresee hard surface that enable to collect rainwater. The choice of technique depends on quality of paper for recycling, on how it is packed, on the availability of space and on the possibility to build new infrastructures.

BAT 45

Waste water and emissions to water

Q26: A mill uses virgin and paper for recycling as raw material: what is the BATAELs?

A26: The mill should calculate a weight average of the two BAT-AELs based on the tonnage produced.

BAT 45 & BAT 50

Waste water

Q27: We have today a limit of 40mg/l for BOD while the BAT conclusions mentions 25mg/l as 'expected value', what shall we do?

A27: 25mg/l BOD is a performance reference value (BAT-AEPL); it is not a BAT-AEL and is not meant to be the basis for limit values, but local authorities can decide to do this beyond IED requirements.

Q28: The COD in the effluent of our mill is 20% above the BAT-AEL max value, but we discharge to a very big river where we only represent 0,01% of the flow and no effect to the river, can we continue doing this?

A28: The authorities must reduce your COD limit to at least the maximum of the BAT-AEL range which you must meet by end of September 2018 the latest.

BAT-AELs for paper made of TMP, DIP and chemical pulp

Q29: How should BAT-AEL for COD be calculated for paper which is made from integrated mechanical pulp, integrated DIP and purchased chemical pulp (e.g. 34 % TMP, 33 % DIP and 33 % purchased chemical pulp)?

A29: Higher BAT COD level for paper mill integrated to mechanical pulping: 4.5 kg/t paper. Higher BAT COD level for paper mill integrated to DIP: 3.0 kg/t paper => 0.5x4.5 + 0.5x3.0 = 3.75 kg/t paper i.e. not taking into account for the paper production load (pulp is divided 50/50. It should be noted that that interpretation among EU member states varies.

BAT 50

Papermaking

Q30: How should BAT conclusions for papermaking and related processes be applied?

A30: The BAT conclusions apply to all non-integrated paper mills and board mills and to the paper and board making part of integrated kraft, sulphite, and CTMP and CMP mills. This means, that BAT levels given for non-integrated paper making (Table 20) cannot be used for paper mill which is integrated to mechanical pulp mill and which uses purchased chemical pulp. In addition, processing paper for recycling should be considered assessing if BAT per papermaking is applicable or not and to which extend. It is integrated even if you buy some pulp (market pulp data was not collected during review).

References, Further Reading and Websites

- **BAT conclusions for pulp, paper and board (September 2014)**
  2014/687/EU: Commission Implementing Decision of 26 September 2014 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for the production of pulp, paper and board (notified under document C(2014) 6750) Text with EEA relevance. OJ L 284, 30.9.2014, p. 76–126 (BG, ES, CS, DA, DE, ET, EL, EN, FR, HR, IT, LV, LT, HU, MT, NL, PL, PT, RO, SK, SL, FI, SV)
  http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:JOL_2014_284_R_0017

- **Best available techniques (BAT) reference document (BREF) for the production of pulp, paper and board (2015)** *(published May 2015)*
  http://eippcb.jrc.ec.europa.eu/reference/pp.html (CEPI document ENV-15-085)

- **A summary record of 6 May 2014 meeting (IED Article 75 Committee)**

- **BREF development guideline (February 2012)**
  2012/119/EU: Commission Implementing Decision of 10 February 2012 laying down rules concerning guidance on the collection of data and on the drawing up of BAT reference documents and on their quality assurance referred to in Directive 2010/75/EU of the European Parliament and of the Council on industrial emissions (notified under document C(2012) 613) Text with EEA relevance. OJ L 63, 2.3.2012, p. 1–39 (BG, ES, CS, DA, DE, ET, EL, EN, FR, IT, LV, LT, HU, MT, NL, PL, PT, RO, SK, SL, FI, SV). Special edition in Croatian: Chapter 15 Volume 012 P. 273 – 311.
  http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32012D0119

- **Industrial Emissions Directive (IED) (November 2010)**
  Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) Text with EEA relevance. OJ L 334, 17.12.2010, p. 17–119 (BG, ES, CS, DA, DE, ET, EL, EN, FR, IT, LV, LT, HU, MT, NL, PL, PT, RO, SK, SL, FI, SV). Croatian: V.015, P.159-261
  http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32010L0075

- **European Commission – DG Environment**
  Industrial emissions website: http://ec.europa.eu/environment/industry/stationary/
  FAQ: http://ec.europa.eu/environment/industry/stationary/ied/faq.htm

- **European IPPC Bureau**
  Bureau website: http://eippcb.jrc.ec.europa.eu/
  Reference documents: http://eippcb.jrc.ec.europa.eu/reference/

- **IMPEL – Network for the implementation and enforcement of environmental law**
  Network website: www.impel.eu

- **Confederation of European Paper Industries (CEPI)**
  Website: www.cepi.org

Annex 1 Variation of emissions during different periods

Variation of emissions during different reference periods

Extracted from BREF-PP Chapter 10 (Annex II).

Note: Data is provided by Spanish authorities; and may be different in other countries.

The emissions to water and air for different reference periods vary over time and this should be borne in mind when deriving BAT-AELs for a given mill.

In permits and for establishing permit compliance for pulp and paper mills different concentration- or load-based emission or target values with different time references (daily, monthly, yearly means) are used.

In order to facilitate the widest possible use of the presented emission data, it seems useful to discuss the relationships between the different applied reference periods in order to enable a reliable comparison of such data and to objectively interpret the BAT-AELs.

Data presented in BREF Annex 10.2 Variations of emissions over the time, represent different reference periods yearly, monthly and daily average values an provide variability factors based on real and validated data from different pulp and paper mills.

Table 10.3: Mean yearly, monthly and daily values for specific COD emissions from four mills

Type of mill	COD kg/ADt			Daily/yearly mean variability factor
	Yearly average	Highest monthly average	95th percentile of daily mean values	
Market bleached kraft	11.15	12.82	17.12	1.53
Kraft pulp partially integrated with coated paper	7.17	7.95	14.25	1.99
Packaging paper with deinking	1.04	1.15	1.85	1.78
Coated paper	1.71	2.08	2.65	1.55
Source: [177, Spanish Ministry of Environment 2009]				

Table 10.4: Day/year variability factors in recovery boilers

Air emissions variability in recovery boilers						
95th percentile daily value/ yearly average value						
No of Recovery Boiler	Parameter					Average of day/year variability in recovery boilers
	Dust	NO_X	SO_2	TRS	SH_2	
1	1.6	1.23	2.67		2.35	2.1
2	1.94	1.13	2.17	1.33		
3	1.96			4.2		
4	1.87		2.26	2.71	1.8	
5	2.56	1.18	2.98	1.91	2.0	
6	1.77	1.59	2.52		2.12	
7	1.32	1.27	1.94		2.6	
8	1.77		2.43	3.72	2.07	
Day/year variability average	1.85	1.28	2.42	2.77	2.16	
Source: [10. Spanish Ministry of Environment 2012]						

Table 10.5: Day/year variability factors in lime kilns

Air emissions variability in lime kilns						
95th percentile daily value/ yearly average value						
No of Lime kiln	Parameter					Average of day/year variability in lime kilns
	Dust	NO_X	SO_2	TRS	SH_2	
1	1.7	1.54	2.56		2.72	2.23
2	1.67			2.4		
3	2.34	2.17	2.81	2.91		
4	1.6	1.33	3.92	1.59	1.55	
5	2.67	1.66	1.99		2.84	
Day/year variability average	2.00	1.68	2.82	2.3	2.37	
Source: [10. Spanish Ministry of Environment 2012]						

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