IMS/N9111/DH/07-004

Discussion document

Discharge standards – concentrations or loads?

1) Introduction

Companies that discharge wastewater must comply with the discharge conditions imposed by the environmental permit. In Flanders, those discharge standards are usually expressed as concentrations that may not be exceeded in the discharged wastewater.

Some companies/sectors are requesting that the concentration standards be replaced by a standard based on pollutant loads, or for the standards specifying the permitted maximum concentrations to be replaced by standards specifying the permissible average concentrations. The requests they submit generally refer to one of the following reasons:

- fluctuations in effluent quality, e.g. seasonal or activity-specific fluctuations, which can lead to the imposed concentration standards being (temporarily) exceeded
- intensive water re-use, which can lead to an accumulation of certain substances, thereby increasing the discharge concentrations.

In this discussion document, the Flemish Centre of Excellence in the Best Available Techniques (Vlaams Kenniscentrum voor Beste Beschikbare Technieken) examines which forms of discharge standard are the most suitable in different situations. This involves checking which standards:

- correspond to the BAT principle (criterion 1)
- provide sufficient protection of surface water quality (criterion 2)
- are enforceable in practice (criterion 3)

That discussion will be presented in a form that is independent of a specific sector. In future BAT studies, this document can be used as a basis to formulate recommendations on BAT-related discharge conditions for specific sectors.

2) Types of discharge standards that are theoretically possible

Discharge standards can *theoretically* be expressed in different ways. In that regard, we can distinguish between concentration standards and load standards. Hybrid forms and combinations of concentration-based and load-based standards are also possible.

a. <u>Concentration standards</u>
   The permitted concentration of a parameter in the discharged wastewater, expressed in a unit of measurement such as mg/l. We can also distinguish between:
   - Maximum concentration standards
     The permitted maximum concentration of a parameter in the discharged wastewater. This the most common form of discharge standard in Flanders[1].

1 In accordance with Art. 4.2.6.1 of VLAREM II on the assessment of the measurement results during technical checks of the discharge of wastewater, the checks must always include an initial assessment, based on a scoop sample. The standard is then used as a standard for

items such as a discharge requirement for COD, which must not exceed 125 mg/l

- Average concentration standards
  The permitted average concentration of a parameter in the discharged wastewater. Depending on the period to be averaged out, this may take the form of 3-day averages, a weekly average, monthly averages, etc., for example,
  such as a discharge requirement for COD of: 125 mg/l as a weekly average
- Combinations of the above
  An average concentration standard can be combined with a maximum concentration standard,
  such as a discharge requirement for COD of: 125 mg/l as a weekly average, 250 mg/l as a maximum
- Differentiated concentration standards
  It is also possible to differentiate concentration standards to take account of seasonal or activity-specific fluctuations, or of water saving or re-use measures that have been applied,
  such as a COD of: 125 mg/l when processing raw material A, 250 mg/l when processing raw material B
  Differentiated concentration standards apply at sector level. At installation level, the applicable standard (possibly several standards in the case of seasonal activities) can be laid down in the environmental permit.

b. Load standards
   - Load per time period
     The permitted quantity of a parameter that may be discharged during a specified period, expressed in a unit of weight per unit of time (e.g. kg/year),
     such as a discharge requirement for COD, which must not exceed 500 kg/year
   - Load per unit of activity
     The permitted quantity of a parameter that may be discharged, expressed in relation to a unit that is characteristic of the activity level (e.g. kg/tonne of product generated, kg/tonne of raw material consumed, mg/m² of surface treated, etc.),
     such as a discharge requirement for COD, which must not exceed 100 mg/kg of raw material processed

c. Combinations of load standards and concentration standards
   - A load standard may also be combined with a concentration standard,
     such as a discharge requirement for COD, which must not exceed 500 kg/year,
     with a maximum concentration of 250 mg/l

d. Hybrid forms of load standards and concentration standards
   - Concentration standards in combination with a specific reference volume

---

(instantaneous) concentration In the case of facilities, which, in accordance with Article 4.2.5.1.1., are equipped with flow measurement and sampling equipment, it is possible, in a number of cases, (namely if the analysis of the scoop sample shows that for a parameter, other than flow, acidity, temperature, taste, odour and the substances in List I of Annex 2C, the measured value is higher than the emission limit value applicable to the parameter concerned, but less than two times' the emission limit value), for the same parameter to be determined in the 24-hour mixed sample, at the operator's expense. If the value measured in that mixed sample is higher than the emission limit value, the limit value will be deemed to have been exceeded. Strictly speaking, the standard is not therefore used in such cases as an instantaneous standard, but rather as a daily average.

For a number of sectors, Annex 5.3.2 to VLAREM II states that the sectoral discharge standards (concentration standards) are valid for a certain "specific reference volume" of the effluent. This specific reference volume is expressed in m^3 of wastewater/activity level (e.g. in m^3 of wastewater per kg of raw material consumed). If the actual wastewater volume of an installation deviates from the reference volume, Article 5.3.2.4, Section 3 of VLAREM II states that it is possible, in the permit, to convert the discharge conditions (converting higher concentration standards at lower wastewater volumes; lower concentration standards at higher wastewater volumes). In this case, the permitted load (expressed per unit of activity) remains the same. If the reference volume is applied in this way (which may be included in the permit at the operator's request), a load approach is actually being used, whilst the standard itself is still expressed as a concentration standard.

3) Assessment against criterion 1: compliance with the BAT principle

The Best Available Techniques form an important starting point when determining permit conditions. In order to be in line with the BAT, discharge standards must:

- on the one hand be so stringent that companies are obliged to apply the Best Available Technique (for purposes such as water treatment)
- on the other hand not be so stringent that they oblige companies to apply techniques (for purposes such as water treatment) that go beyond the BAT
- and not be so stringent that companies are prevented from applying the Best Available Technique (for purposes such as water saving or re-use)

For the purposes of further discussion, we assume that a BAT analysis has been carried out for a given sector and that it is therefore known:

- which techniques are BAT, both in terms of prevention and in terms of wastewater treatment and in terms of water saving or re-use
- what effluent quality is achievable using the BAT

We can distinguish between 3 cases (see Figure 1):

- the effluent quality achievable using the BAT does not vary greatly within the sector (**Case a**)
- the effluent quality achievable using the BAT varies within the sector, due to factors such as the activities carried out (such as the nature of the raw materials processed) or the type of company (e.g. small or large businesses). For companies with varying activities during the course of the year (seasonal activities), the achievable effluent quality will therefore vary over time (**Case b**)
- The effluent quality achievable using the BAT will depend on the degree of water saving or re-use (**Case c**).

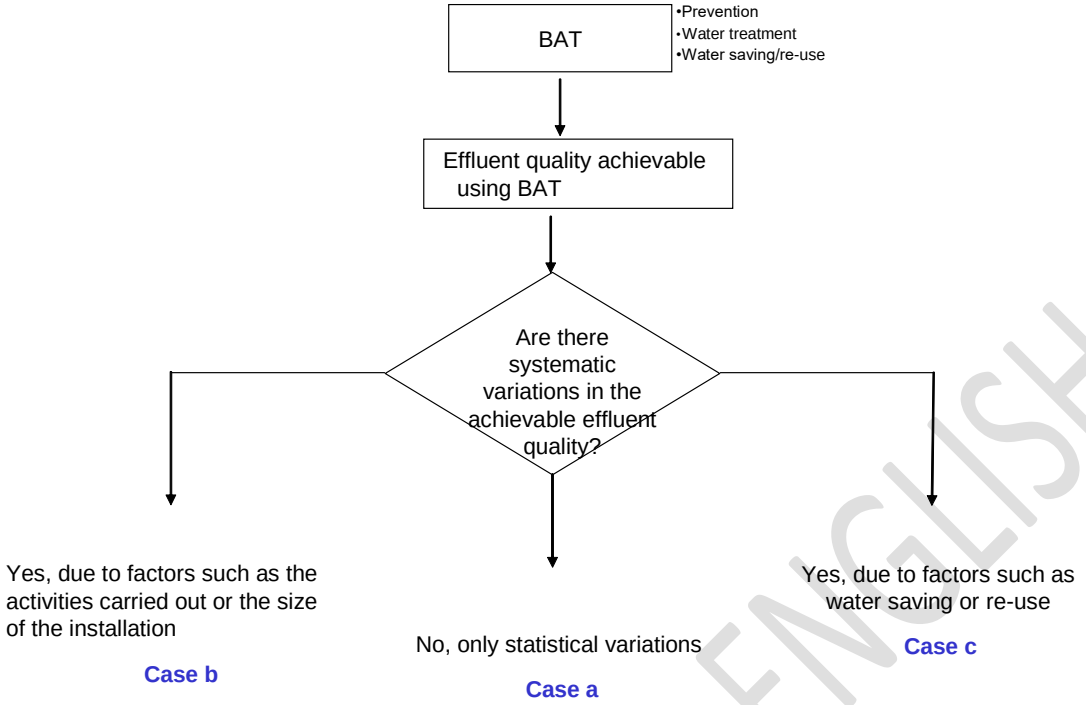

Figure 1: effluent quality achievable using BAT at sector level: 3 cases

Note: Which case applies in a specific context can differ from one parameter to another. For example, in the case of water re-use, the effluent quality achievable using BAT for some parameters (such as oxygen) may be independent of the degree of water re-use (or even better in the case of water re-use), whilst the effluent quality for other parameters (such as salts) may well be dependent on the degree of water re-use (see Table 1). Which case applies to which parameter must be apparent from the BAT analysis (see, for example, the analysis in the BAT study for surface treatment – in preparation).

Table 1: The effluent qualities and loads achievable using BAT as a function of water saving or re-use (hypothetical examples)

% water saving or re-use[2]	0%	50%	90%
Volume of wastewater	1000 m³	500 m³	100 m³
Parameter X – **Case a** - Effluent quality achievable using BAT - Load achievable using BAT	 10 mg/l 10 kg	 10 mg/l 5 kg	 10 mg/l 1 kg
Parameter Y – **Case c** - Effluent quality achievable using BAT - Load achievable using BAT	 10 mg/l 10 kg	 15 mg/l 7.5 kg	 50 mg/l 5 kg
Parameter Z – **Case c** - Effluent quality achievable using BAT - Load achievable using BAT	 10 mg/l 10 kg	 20 mg/l 10 kg	 100 mg/l 10 kg

[2] In this example, it is assumed that all percentages of water saving or re-use can be BAT, depending on the specific situation of the business.

a. Case a: The effluent quality achievable using BAT does not vary greatly

This relates to parameters, in which the effluent quality achievable using BAT within a sector is not subject to large systematic fluctuations, due to factors such as the activities carried out or the size of the installation, and is less dependent on the degree of water saving or re-use. There is of course a certain statistical variation (e.g. fluctuations from hour to hour, from day to day).

The effluent quality achievable using BAT and the corresponding concentration standards are presented schematically in Figure 2.

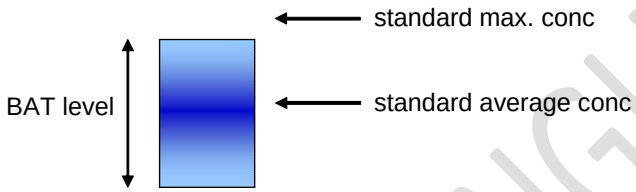

Figure 2: The effluent quality and concentration standards achievable using BAT in Case a

- Maximum concentration standard
  In this case, the BAT-based maximum concentration standard may be set to just above (or on the upper limit of) the BAT level (see Figure 2). In order to comply with this standard, companies will be obliged to keep their concentrations within the BAT level and therefore to make use of the BAT. This standard is therefore in line with the BAT principle.

- Average concentration standard
  In this case, a BAT-based average concentration standard may be set to just above the average BAT level (see Figure 2). In order to comply with this standard, companies will be obliged to keep their concentrations within the BAT level and therefore to make use of the BAT. This standard is therefore also in line with the BAT principle.
  An average concentration standard (e.g. to supplement a maximum concentration standard) has primarily been found useful in cases in which the statistical variation of the effluent quality achievable using BAT is relatively large, as illustrated in the left-hand section of Figure 3. If, in such cases, only a maximum concentration standard is imposed, there is a chance that companies will apply techniques that are of lower quality than the BAT (see the right-hand part of Figure 3), but that still permit the maximum concentration standard to be met. Imposing an average concentration standard alongside the maximum concentration standard makes this impossible and companies are therefore obliged to use the BAT.

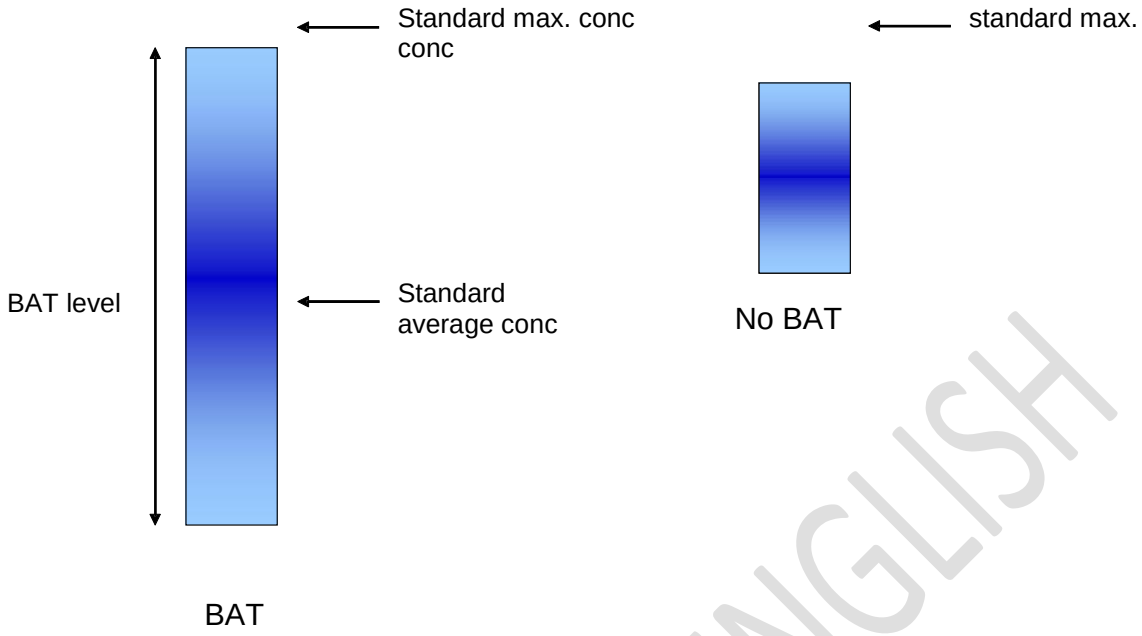

Figure 3: Effluent quality and concentration standards achievable using BAT in Case a, when there is large statistical variation in effluent quality

- Time-based load standards
  In theory, a time-based load standard can also be calculated, based on the concentration levels when using the BAT.

  Time-based load standard (g/year) =

  Average concentration standard (mg/l) x wastewater volume (m^3/year)

  This standard will also oblige companies to use the BAT and is therefore, in principle, in line with the BAT. To determine the standard, additional information about the volume of wastewater will however be needed (in m^3/year). This wastewater volume is a highly installation-specific parameter (and depends, amongst other things, on the size of the installation), as a result of which it is not possible to determine a BAT-related value at sector level. A time-based load standard can therefore only be derived at installation level, not at sector level.

- Activity-based load standards
  In theory, the BAT concentration levels can also be used as a basis for calculating an activity-based load standard.

  Activity-based load standard (g/unit of activity) =

  Average concentration standard (mg/l) x specific wastewater volume (m^3/unit of activity)

  This standard will also oblige companies to use the BAT and is therefore, in principle, in line with the BAT. To determine the standard, additional information will however be needed (namely regarding the specific wastewater volume). In theory and unlike the absolute wastewater volume (in m^3/year), the specific wastewater volume (in m^3/unit of activity) can actually be determined at sector level. In practice, however, determining this specific wastewater volume at sector level (or the BAT-related level thereof) can prove very difficult as the relationship between discharged wastewater flows and activities carried out can be very complex and installation-dependent.

Note: Note that the above formulas for calculating the load standards use the "average concentration standard" rather than the "maximum concentration standard" (see Figure 2). Using the "maximum concentration standard" in the calculation would result in a load standard that would be insufficiently stringent to be in line with the BAT.
The wastewater volume being used in the calculation will be the effectively discharged volume (not the maximum permitted volume).

Conclusion in Case a:
In cases where the effluent quality achievable using BAT is not subject to large systematic fluctuations, due to factors such as the activities carried out or the size of the installation, and depends only slightly on the degree of water saving or re-use, both the concentration standard and load standard are ***in theory*** *in line with the BAT principle, on condition that they are determined correctly.*
As far as load standards are concerned, only activity-based load standards can be determined at a sector level. At installation level, time-based load standards can also be determined. Compared to concentration standards, determining the BAT level correctly for load standards is more complex, and in some cases, impossible, ***in practice,*** *certainly at sector level, due to the fact that the relationship between the discharged wastewater flows and activities carried out can be very complex and can differ, depending on the installation.*
Taking these practical aspects into account and from a BAT point of view, preference is given to concentration standards ahead of load standards in Case a.

b. Case b: The effluent quality achievable using BAT is subject to strong systematic fluctuations due to factors such as the activities carried out or the size of the installation

These are cases in which the effluent quality achievable using BAT is subject to large systemic fluctuations due to factors such as the activities carried out or the size of the installation. For companies with varying activities during the course of the year (seasonal activities), the achievable effluent quality will therefore vary over time.

By way of clarification: these are solely fluctuations that are considered to be in line with the BAT and not fluctuations that can be avoided by applying the BAT.

A schematic diagram of the effluent quality achievable using BAT and the corresponding discharge values can be found in Figure 4. In this figure, the letters A and B refer to two distinct situations (e.g. two types of raw materials – this could relate to the vegetable processing sector for example). In practice, three or more distinct situations may, of course, exist.

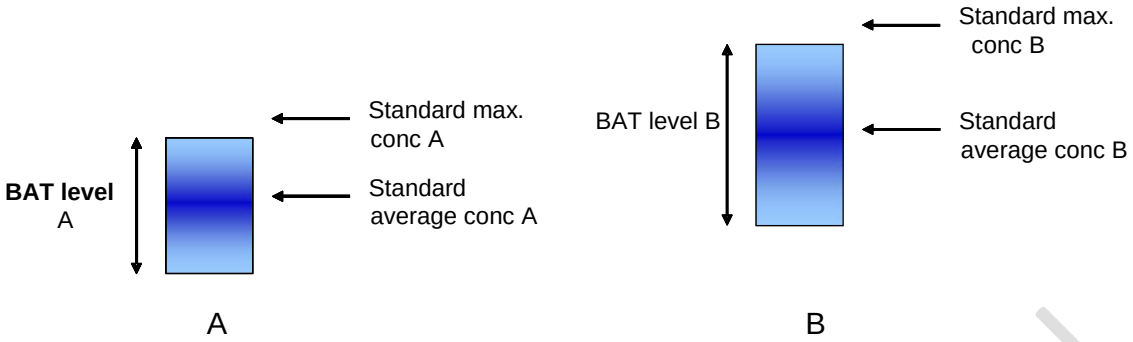

Figure 4: The effluent quality and concentration standards achievable using BAT in Case b

- Maximum concentration standard
  In this case, it is impossible to determine *a single* maximum concentration *standard* that applies across the entire sector and is fully in line with the BAT. After all, the standard that is in line with the BAT in situation A ("standard max. conc A" in Figure 4) cannot be achieved in situation B. Although the standard that corresponds to the BAT in situation B ("standard max. conc B" in Figure 4) is achievable in situation A, it is actually too flexible here and will therefore not oblige companies to apply the BAT in situation A. A single fixed maximum concentration standard is therefore not in line with the BAT.

- Differentiated concentration standards
  Differentiated concentration standards (in Figure 4: separate concentration standards for situation A and for situation B) are actually in line with the BAT in this case. The use of differentiated concentration standards means that companies within the same sector may be subject to different standards for certain parameters, e.g. according to the raw material they process. It may also mean that companies with varying activities during the course of the year (seasonal activities) have to comply with different standards at different times of the year.
  Differentiated concentration standards are set at sector level. At installation level, the applicable standard (possibly several standards in the case of seasonal activities) must be laid down in the environmental permit. When using differentiated concentration standards, the aim should be to establish and define, in a clear and verifiable manner, the conditions under which the different standards apply. Sometimes, however, it will not be possible to determine those conditions precisely at sector level, because the link between causal parameters and achievable concentrations cannot be established unequivocally in all cases. In such cases, the second option is to express the differentiated concentration standards in the form of a range, e.g. "15 mg/l unless otherwise specified in the permit, subject to a max. of 40 mg/l". In any case, the environmental permit must clearly indicate which standard applies.

- Average concentration standard
  In principle, the same reasoning applies to the average concentration standards as to the maximum concentration standard.

- Time-based load standards
  In theory, a time-based load standard based on the BAT concentration levels can also be calculated at installation level, as in Case a. The concentration levels applicable to the installation (situation A or B in Figure 4) should, of course, be taken into account. For companies with varying activities during the year (seasonal activities), a separate load standard can be calculated for each season:

  Time-based load standard A (g/season A) =

  Average concentration standard A (mg/l) x wastewater volume A (m^3/season A)

  Time-based load standard B (g/season B) =

  Average concentration standard B (mg/l) x wastewater volume B (m^3/season B)

  As in Case a, a time-based load standard is in principle in line with the BAT (if correctly determined), but such a standard can only be determined at installation level. For companies with varying activities during the course of the year (seasonal activities), a time-based load standard can only be determined correctly if the relative importance of situations A and B is known in advance.

- Activity-based load standards
  In theory, activity-based load standards based on the BAT concentration levels can also be calculated at sector level, as in Case a. In order to be in line with the BAT, these load standards will also need to be determined on a differentiated basis (i.e. separate load standards for situations A and B in Figure 4):

  Activity-based load standard A (g/unit of activity A) =

  Average concentration standard A (mg/l) x specific wastewater volume A (m^3/unit of activity A)

  Activity-based load standard B (g/unit of activity B) =

  Average concentration standard B (mg/l) x specific wastewater volume B (m^3/unit of activity B)

  As in Case a, determining the specific wastewater volume (or the BAT-related level thereof) can prove very difficult in practice as the relationship between discharged wastewater flows and activities carried out can be very complex.

*<u>Conclusion in Case b</u>: In the event that the effluent quality achievable using BAT is subject to large systematic fluctuations due to factors such as the activities carried out or the size of the installation, a single fixed standard is not line with the BAT principle. This means that differentiated standards are then in line with the BAT principle. **In theory,** this applies to both differentiated concentration standards and differentiated load standards.*

*However, as in Case a, the situation in the case of load standards is more complex when compared to concentration standards and, in some cases, it is impossible to determine the level of BAT correctly **in practice,** especially at sector level.*
Taking these practical aspects into account and from a BAT point of view, preference is given to differentiated standards in Case b.

c. Case c: The effluent quality achievable using BAT will depend on the degree of water saving or re-use

In many cases (but certainly not always), water saving or re-use leads to higher concentrations in the wastewater to be treated. This does not necessarily mean that the BAT-related concentrations in the discharged (= treated) effluent will also be higher. Despite being present in higher concentrations in the wastewater to be treated, using the BAT means that some constituents can actually be disposed of at the same low level of concentration as they could before the water saving or re-use measures were introduced. For other constituents, however, (a typical example of these being salts), it may not be technically or economically feasible to reach the same concentrations as before following the introduction of water saving or re-use measures, even though the total contaminant load will generally remain constant, or even decrease. In this case, the effluent quality achievable using BAT for those components will depend on the degree of water saving or re-use (see Table 1).

In this case, the effluent quality achievable using BAT and the corresponding discharge standards can be presented in a similar way as in Case b (see Figure 4). In the figure, the letters A and B refer in this case to the situation without (A) and with (B) water saving or re-use.

- Fixed concentration standard
  As in Case b, applying a single fixed concentration standard that takes no account of the degree of water saving or re-use is not in line with the BAT in this case.

- Differentiated concentration standards
  In this case, differentiated concentration standards, in which the standard is linked to the degree of water saving or re-use, or the water saving or water re-use techniques used (see the examples in Table 2) are in line with the BAT.
  Differentiated concentration standards are set at sector level. At installation level, the applicable standard must be laid down in the environmental permit.

Table 2: Differentiated concentration standards in the case of water saving or water re-use within a sector (hypothetical examples)

Technique	Concentration standard
No water re-use	10 mg/l
Re-use of water stream X only	15 mg/l
Re-use of water stream Y only	15 mg/l
Re-use of water streams X and Y	20 mg/l

Specific water consumption or specific wastewater volume	Concentration standard
< x l/tonne of product	50 mg/l
x-y l/tonne of product	25 mg/l
y-z l/tonne of product	10 mg/l
> z l/tonne of product	5 mg/l

When using differentiated concentration standards, the aim should be to establish and define, in a clear and verifiable manner, the conditions under which the different standards apply. This is not always easy in practice because the relationship between the techniques applied, the water savings realised and the effluent quality that is achievable can be very complex. The most effective basis for differentiation (e.g. linking standards to a specific level of water consumption, linking standards to the water-saving techniques employed) depends on the sector-specific context.
If it is not possible to clearly establish the link between the techniques applied, the water savings realised and the effluent quality achievable at sector level, a second option is to express the differentiated concentration standards in the form of a range, e.g. "15 mg/l unless otherwise stipulated in the permit, subject to a maximum of 40 mg/l". In any case, the environmental permit must clearly indicate which standard applies.

- Concentration standards in combination with a specific reference volume
  By linking concentration standards to a specific reference volume, the standards can be converted for each installation in relation to its water consumption. This will lead to a de factor differentiation of the standards, according to the degree of water saving or re-use (see Table 3).

Table 3: Converting concentration standards by means of reference volumes (Vol Ref)

Specific wastewater volume	Concentration standard
Vol Ref	Standard Ref
Vol A	(Vol Ref x Standard Ref)/Vol A
Vol B	(Vol Ref x Standard Ref)/Vol B

Due to the conversion formula used, the permitted load (expressed on the basis of activity) remains the same for all installations. This approach is therefore only in line with the BAT principle for those activities/parameters for which, when the BAT is applied, the discharged load remains constant, irrespective of the degree of water saving or re-use. As illustrated in Table 2, this is far from being the case for all activities/sectors. The use of concentration standards and reference volumes is therefore in line with the BAT in a limited number of cases only.

- Time-based load standards
  In theory, a time-based load standard based on the BAT concentration levels can also be calculated according to the same formula as in Case a. In this formula, of course, the concentration standard corresponding to the degree of water saving or water re-use must be taken into account.

A time-based load standard is, by definition, installation specific, which means that it can only be determined at installation level, not sector level.

- Activity-based load standards
  In theory, the BAT concentration levels can also be used as a basis for calculating an activity-based load standard. In order to be in line with the BAT, these load standards will also need to be determined on a differentiated basis (i.e. separate load standards for situations A and B in Figure 4). In some cases, the calculated load standard will be constant, i.e. independent of the degree of water saving or re-use. This is the case for parameters for which, when applying the BAT, the discharged load remains constant, irrespective of the degree of water saving or re-use. As illustrated in Table 2, this is far from being the case for all activities/sectors.

Activity-based load standard (g/unit of activity) =

Average concentration standard (mg/l) x specific wastewater volume (m^3/unit of activity)

This standard is therefore also in line with the BAT. To determine the standard, additional information will however be needed (namely regarding the specific wastewater volume).

Conclusion in Case c: In cases where the effluent quality achievable with BAT depends on the degree of water saving or re-use, a single fixed concentration standard for the whole sector would not be in line with the BAT principle. Differentiated concentration standards, linked to the degree of water saving or re-use or to the water saving techniques applied, are in line with the BAT principle. This also applies to freight standards, but these too should be determined in a differentiated way (only in specific cases is one fixed freight standard, independent of the degree of water saving or re-use, in line with the BAT). In specific cases, concentration standards linked to a specific reference volume may also be in line with the BAT, but this is rarely the case. In all cases, additional information will be needed on the relationship between the activities carried out and the water-saving or water re-use techniques applied on the one hand and the volume of wastewater discharged on the other hand, in order to determine the standards correctly.

4) Assessment against criterion 2: Environmental quality

From an environmental quality point of view, the following preconditions must be taken into account when drawing up discharge conditions:

- The total quantity of pollutants ending up in the environment must be kept within limits.
- Discharges of the most hazardous substances must be limited as much as possible.
- Acute toxicity must be prevented at all cases.

Note: Acute toxicity is a local problem that needs to be assessed/addressed at installation level. It is therefore not so much an item of attention when determining sectoral discharge standards, but rather when determining special discharge conditions.

- Concentration standards
  Verifying concentrations in itself affords no guarantee that the total quantity of pollutants discharged will be limited to a specific quantity, in view of the fact that flow rate forms an important factor in that regard. Nevertheless, the environmental permits for the discharge of wastewater still impose a maximum flow rate, however. In principle, the combination of a concentration standard with a maximum permitted flow rate is a suitable tool when it comes to limiting the total quantity of pollutants released into the environment.
  Concentration standards are also an effective means of excluding peak discharges of the most hazardous substances, for example, and of preventing acute toxicity.

- Load standards
  Load standards ensure a targeted reduction of the total quantity of pollutants discharged into the environment.
  However, they afford no guarantee that peak discharges and acute toxicity will be prevented.

Conclusion: Both concentration and load standards can be used to limit the total quantity of pollutants discharged. However, load standards afford no guarantee that peak discharges of the most hazardous substances and acute toxicity will be prevented. If a load standard is imposed, it is therefore best to combine this with a maximum concentration standard, especially for the most hazardous substances.

5) Assessment against criterion 3: Enforceability

Standards that are not enforceable are also ineffective. Enforceability therefore forms an essential pre-condition when establishing a discharge standard.

Technical checks by the supervisory authority into the discharge of wastewater are governed by Article 62 of VLAREM I and by Section 4.2.6 of VLAREM II. In accordance with the provisions of Section 4.2.6 of VLAREM II, the law requires that the check must begin with an initial assessment of a scoop sample. The mixed sample is only used in a very limited number of cases (see also footnote 1, p. 1). This means that under the current legal framework, standards that the authority is unable to verify by means of a scoop sample are actually not verifiable at all.

- Maximum concentration standards
  Maximum concentration standards can be checked by analysing a scoop sample. A scoop sample can be taken at any time at all (unannounced). Maximum concentration standards are therefore very easy to enforce.
  As far as enforceability is concerned, a number of special points of attention apply in the case of differentiated concentration standards:
  - In the case of differentiated concentration standards that apply as a result of seasonal activities, the environmental permit must clearly indicate which standard applies at which point in time.

- In the case of differentiated concentration standards based on water saving or re-use, the environmental permit must clearly indicate the maximum concentration that the installation concerned must comply with, taking into account the water saving or re-use techniques applied by the installation. After all, the degree or re-use/saving cannot be verified during the audit.

- Average concentration standards
  When carrying out checks, average concentration standards (e.g. daily, weekly or annual averages) require a longer sampling period. In addition, taking scoop samples is not sufficient. It is necessary to take samples that are proportional to the flows recorded. Average concentrations over a longer period (week, month, etc.) can only be checked by means of self-monitoring (with a possible risk of the measurement results being manipulated). Average concentration standards are therefore less enforceable than maximum concentration standards.
  If average concentration standards are, in fact, imposed, for example as a means of obliging companies to apply BAT (see p. 5), they are most effective when combined with maximum concentration standards. In addition, the permit must impose a requirement that continuous sampling equipment be used.

- Load standards
  Load standards are subject to similar restrictions in terms of enforceability to the ones that apply in the case of average concentration standards. Verifying load standards requires concentration and flow measurements to be performed over an extended period. Load concentrations over a longer period (week, month, etc.) can only be checked by means of self-monitoring (with a possible risk of the measurement results being manipulated).

Conclusion: From the point of view of enforceability, maximum concentration standards are preferable. They can be verified by means of a scoop sample, which is a requirement under the current legal framework. Average concentration and load standards require longer sampling periods and are more difficult to monitor and enforce by the supervising authority (and are not even enforceable under the current legal framework).
Wherever differentiated concentration standards are used, it is important for reasons of enforceability that the ultimately applicable standards are clearly laid down in the environmental permit at installation level.

6) Conclusions

Theoretically, both concentration standards and load standards can be in line with the BAT principle. In practice, however, load standards make it more difficult to correctly determine the level of BAT, as this presupposes knowledge of the relationship between the flow rates of wastewater discharged and the activities carried out. Taking this practical bottleneck into account and from a BAT point of view, preference is given to concentration standards ahead of load standards. Concentration standards are also preferred in order to achieve surface water quality objectives and enforce discharge conditions.

Account must however be taken of the fact that for certain sectors, the effluent quality achievable using BAT may depend on the activities performed/installation types, or on the amount of water saved or re-used. In these cases, having a single fixed concentration standard for the entire sector will not be in line with the BAT principle.

In these cases, concentration standards differentiated *at sector level* are considered to be the most appropriate. Examples of this are:

- differentiation according to activities performed/installation types
- differentiation according to the amounts of water saved or re-used, or according to the techniques applied for water saving or re-use (in which case more flexible standards may apply to certain activities/parameters as more water is saved or re-used).

At installation level, it is important that the applicable standard is clearly determined on the permit.

The decision tree below can be used as a guideline when formulating a proposal for BAT-based discharge conditions in BAT studies. The intention is that this decision tree must be worked through separately for each parameter.