Influence of New WI-BREF on the Concepts of Flue Gas Cleaning in the Future – What Will Change?

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1. IED and WI-BREF

Following the introduction of Industrial Emission Directive (IED) [4] in 2010, the position of WI-BREF with regard to the approval of new plants and also the continued operation of existing plants changed considerably. With the IED it was stipulated that

- the Best Available Reference Documents (BREF) and by this also the Waste Incineration (WI) BREF have to be revised,
- the Best Available Techniques (BAT) Conclusions have to be published in a separate document,
- the BAT Conclusions have to be transferred into national law by the member states of the EU.
The revision of WI BREF started in 2017. Meanwhile the plant operators have been requested by the European IPPC Bureau to report on the real emission values of the corresponding operational plant. The results will be used for the definition of Best Available Techniques Associated Emission Levels (BATAELs). These BATAELs are forming the basis for the emission limit values in the scope of approval of new plants. Furthermore, these ranges of values are defining the condition for the continued operation of existing plants. Upon passing of WI BREF, each member state of the EU has to determine statutorily emission limit values within the national framework, taking into account the requirements of BAT Conclusions. With regard to existing plants the proof of new limit values has to be provided within four years.

In 2017 the tentative draft of revised WI-BREF [1] was published. In the meantime, the Final Meeting of Technical Working Group took place in April 2018. As a result the new limit values to be expected have among other things been published (Table 1) [14].

Table 1: BATAELs (results from Final Meeting TWG)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>BATAELS (2006)</th>
<th>ELV IED(+CI)</th>
<th>New BAT-AEL for new plants</th>
<th>New BAT-AEL for existing plants</th>
<th>Unit</th>
<th>Sampling period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust</td>
<td>1 – 5</td>
<td>10 (± 3)</td>
<td>&lt; 2 – 5</td>
<td></td>
<td>mg/Nm³</td>
<td>daily</td>
</tr>
<tr>
<td>TOC</td>
<td>1 – 10</td>
<td>10 (± 3)</td>
<td>&lt; 3 – 10</td>
<td></td>
<td>mg/Nm³</td>
<td>daily</td>
</tr>
<tr>
<td>HCl</td>
<td>1 – 8</td>
<td>10 (± 4)</td>
<td>&lt; 2 – 6</td>
<td>&lt; 2 – 8</td>
<td>mg/Nm³</td>
<td>daily</td>
</tr>
<tr>
<td>HF</td>
<td>1</td>
<td>1 (± 0,4)</td>
<td>&lt; 1</td>
<td>&lt; 1</td>
<td>mg/Nm³</td>
<td>daily</td>
</tr>
<tr>
<td>SO₂</td>
<td>1 – 40</td>
<td>50 (± 10)</td>
<td>5 – 30</td>
<td>5 – 40</td>
<td>mg/Nm³</td>
<td>daily</td>
</tr>
<tr>
<td>NO₅ SCR</td>
<td>40 – 100</td>
<td>50 (± 40)</td>
<td>50 – 120</td>
<td>50 – 150</td>
<td>mg/Nm³</td>
<td>daily</td>
</tr>
<tr>
<td>Hg (SNCR)</td>
<td>1 – 10</td>
<td>over sampling period</td>
<td>2 – 10</td>
<td>2 – 10 (15)</td>
<td>mg/Nm³</td>
<td>daily</td>
</tr>
<tr>
<td>Hg (indicative)</td>
<td>0.001 – 0.02</td>
<td>50</td>
<td>&lt; 5 – 20</td>
<td>&lt; 5 – 20</td>
<td>µg/Nm³</td>
<td>daily</td>
</tr>
<tr>
<td>CO</td>
<td>5 – 30</td>
<td>50 (± 5)</td>
<td>&lt; 10 – 50</td>
<td></td>
<td>mg/Nm³</td>
<td>daily</td>
</tr>
<tr>
<td>PCCD/F</td>
<td>0.01 – 0,1</td>
<td>0,1</td>
<td>&lt; 0,01 – 0,04</td>
<td>&lt; 0,01 – 0,06</td>
<td>mg/Nm³</td>
<td>long term sampling</td>
</tr>
<tr>
<td>PCCD/F + dPcB</td>
<td>0,01 – 0,06</td>
<td>0,05</td>
<td>&lt; 0,01 – 0,06</td>
<td>&lt; 0,01 – 0,08</td>
<td>mg/Nm³</td>
<td>over sampling period</td>
</tr>
<tr>
<td>Cd + Ti</td>
<td>0,005 – 0,05</td>
<td>0,05</td>
<td>0,005 – 0,02</td>
<td></td>
<td>mg/Nm³</td>
<td>over sampling period</td>
</tr>
<tr>
<td>Sb+As+Pb+Cr+Co+Mn+Ni+V</td>
<td>0,005 – 0,5</td>
<td>0,5</td>
<td>0,01 – 0,3</td>
<td></td>
<td>mg/Nm³</td>
<td></td>
</tr>
</tbody>
</table>

The publishing of BAT Conclusions and final version of WI-BREF is scheduled for the end of 2019. Independent of this, the BATAELs listed in table 1, which are providing the framework for limit values in the future, are of course already influencing the concept selection for the flue gas cleaning of WtE-plants. This lecture discusses possible solution approaches for the reliable observance of BATAELs for the separate pollutants in the gas. It may be remarked in addition that primarily in the field of thermal incineration the reduction of pollutants such as CO, TOCs etc. has not been taken into consideration.
2. Process-related solution approaches

2.1. Particle separation

In almost all existing flue gas cleaning concepts and also in those of the future, at least one filtering separator is integrated in the form of a bag filter. If a correct design and execution is provided, this type of separator ensures a very efficient and reliable separation of particles of far more than 99.9 % (Figure 1) [13]. As a result of this, the reliable observance of the range shown in Table 1 for future limit values of < 2 up to 5 mg/Nm³ should be possible.

![Separation curves of different de-dusting systems](image)

**Figure 1:** Efficiency of different particle separators

2.2. Acid crude gases such as HF, HCl and SOₓ

2.2.1. Lime-based processes

Predominantly lime-based processes have so far been used in new plants for the separation of acid crude gases. Figure 2 shows as an example a design of conditioned dry sorption. Further processes are among other things described in [7].
These processes allow the reliable compliance with the today requested limit values, with at the same time acceptable operating costs. Figure 3 [10] shows corresponding crude gas and clean gas values for HCl and SO$_2$ over a period of time of 24 hours.

Figure 3: Trend curves for HCl and SO$_2$ of WtE-plant GML Ludwigshafen
If particularly for HCl the upper range of BATAELs is requested for the operation of a plant, these requirements can also in the future be achieved with the use of the conditioned dry sorption. As a precaution, additional measures for the coverage of crude gas peaks should be integrated in the process concept.

- Injection of an additive powder, as e.g. NaOH, into an evaporative cooler installed upstream of conditioned dry sorption [15]
- Combination spray absorber and conditioned dry sorption [8]

The efficiency of the combination spray absorber with conditioned dry sorption is shown in Figure 4. The corresponding trend curves for crude gas and clean gas values of HCl and SO$_2$ of an incineration line of MHKW Rothensee are illustrated over a period of time of 24 hours. At the time of measurement the limit values complied with the requirements of EU Directive 2000/76/EC [5]. The requested limit values will reliably be observed even in case of a stoichiometric factor lower than 1.8. [8]. To allow the observance of more stringent limit values, the stoichiometric factor should be increased slightly.

As far as lower values have to be considered for HCl and SO$_2$ during design of a new plant, the use of combined processes can be reasonable and/or necessary.

- Combination dry sorption - wet scrubber [11] (see subclause 2.3.2)
- Combination of a dry sorption process using NaHCO$_3$ with a Ca-based process [9]

![Figure 4: Trend curves for HCl and SO$_2$ of WtE-plant MHKW Rothensee](image-url)
2.2.2. Dry sorption with NaHCO$_3$

The dry sorption with NaHCO$_3$ competes with process technologies using Ca-based additive powder qualities. The quite simple process technology of the basic variant is shown in Figure 5. Contrary to Ca-based processes, the efficiency will increase with the dry-bulb temperature in the gas when using NaHCO$_3$. The multiple re-circulation of the particles separated in the filter into the flue gas flow upstream filter is advantageous with regard to the separation efficiency and the stoichiometric factor [12].

![Basic variant of dry sorption with NaHCO$_3$](image)

Figure 5:
Basic variant of dry sorption with NaHCO$_3$

In principle, the current typically requested limit values and the upper values of BA-TAEILs can be observed with this process, however, compared to Ca-based processes, with higher costs for the provision of additive powders. Due to the reason above, this process has mainly be used for smaller incineration plants. This process may gain in importance in the future in combination with SCR-plants. The advantage in this connection is that NaHCO$_3$ allows an efficient separation of SO$_2$ and HCl from acid crude gases, preferably in the case of higher temperatures. A corresponding process variant is discussed under subclause 2.3.3.: Combination of dry sorption with SCR process.

2.3. Reduction of NO$_x$

In the draft of WI-BREF, the limit values for NO$_x$ are specified in a very wide range.

- New plants
  - NO$_x$: 50-120 mg/Nm$^3$
  - NH$_3$: 2-10 mg/Nm$^3$
• Existing plants
  - NO\textsubscript{x} for SCR 50: 150 mg/Nm\textsuperscript{3}
  - NO\textsubscript{x} for SNCR 50: 180 mg/Nm\textsuperscript{3}
  - NH\textsubscript{3}: 2-10 (SNCR 15) mg/Nm\textsuperscript{3}

With regard to existing plants, this offers the opportunity of further operation of sufficiently effective SNCR-systems in the scope of limit values currently valid. Based on the upper values of BATAELs-range, it is still possible to use SNCR-systems for new plants. Regarding the lower range it will surely only be possible to install an SCR-system.

2.3.1. SNCR-process

With regard to the investment costs, the SNCR-process constitutes the most cost-effective variant. The achievable emission values with simultaneous observance of requested NH\textsubscript{3}-slippage are in the order of 80-100 mg/Nm\textsuperscript{3}. In this connection it must be taken into account that the possibility of a correction of emission value to an O\textsubscript{2}-reference content of 11 vol% is not admissible in all countries of EU. As a result of this, a limit value of 80 mg/Nm\textsuperscript{3} may correspond to a real emission value of 96 mg/Nm\textsuperscript{3} if the actual O\textsubscript{2}-content in the gas totals to 9 vol%.

It has to be expected that in future the use of an SNCR-system alone will no longer be sufficient for a large number of plants. In these cases, either the use of a combined process SNCR with downstream installed scrubber or a process with the use of an SCR-system will become necessary.

2.3.2. Combination of SNCR – Conditioned dry sorption – Wet scrubber

This process combination especially represents an alternative when the requested NO\textsubscript{x} emission limit values can reliably be kept by means of an SNCR process, however with a higher NH\textsubscript{3} emission. The basic design of this combined process is shown in Figure 6.

Figure 6: Combination conditioned dry sorption – wet scrubber
In this concept, the conditioned dry sorption is operated in such way that the crude gas downstream of this stage only contains low residual concentrations of acid crude gas pollutants. Depending on the application in question, the downstream installed fine cleaning stage serves for the

- separation of NH₃ in an acid scrubber,
- progressing reduction in emission values e.g. for the acid crude gas components, 
- heat recovery.

Due to the fact that the acid scrubber only serves as a fine cleaning stage for the reduction of HCl beside the separation of NH₃, the waste water quantity can be kept at a low level. Therefore it will be appropriate to add this waste water above the grate near the incineration.

Figure 7: Emission values exemplary shown at WtE-plant Oulun Energia

To allow an operation free from waste water, the waste water from the basic stage should be added to the system near the conditioned dry sorption.

It may be remarked in addition that when using this combined process, extremely low emission limit values can also be achieved for the acid crude gas pollutants HCl and SO₃ (Figure 7).

2.3.3. Combined process with the use of SCR

Combination of conditioned dry sorption with SCR process

As far as NOₓ emission limit values as defined at the lower end of the value range between 50 and 120 mg/Nm³ stated in the draft of WI-BREF have to be observed, the
**THE HOK® SOLUTION**

- Solution for waste gas treatment -

**HOK®** Activated lignite. Flue gas adsorbent and catalyst. First choice for gas cleaning in refuse and special waste incineration and metallurgical processes. Substantial reduction of dioxins and furans.

Sometimes, a single, well-considered decision is all it takes: for the benefit of your company, for the good of the environment.
lichen Zeitpunkt eine mögliche Überladung von Hg für die Abgaswäsche signalisiert und Hg-Rohgasmessung verfügt der Betreiber über eine Überwachung, die zum frühestmöglichen Anstieg, als auch im Abklingen der Hg-Konzentration (Bild 12). Allerdings traten auch immer wieder Spitzen von bis zu 3.000 bis 4.000 µg/m³ auf, was in der Hausmüllverbrennungsanlage betrug die Grundlast im Durchschnitt etwa 200 µg/Nm³. Die Emissionsmessungen zeigten, dass der Standardmessbereich von 0 bis 45 µg/m³ nur für den kleinsten Messbereich von 0 bis 10 µg/Nm³, als auch bis in den sehr hohen Konzentrationsbereich von bis zu 4.000 µg/m³ (Bild 10). Eine schnelle, zuverlässige Rückmeldung sowie eine flexiblen Bedingungen ermöglichten den Betreiber natürlich entsprechende Maßnahmen für die Gasreinigung, um den Grenzwert von Hg-Emissionen zu erreichen. Die Resultate der Testinstallationen zeigen hierbei die Flexibilität des eingesetzten Messverfahrens MERCEM300Z (außen und innen) ohne Leistungs einbußen oder Einschränkungen erfolgreich absolviert.

Das neue Messverfahren konnte bereits für die Emissionsüberwachung des Gesamtprozesses, sowohl für den kleinsten Messbereich von 0 bis 10 µg/Nm³, als auch bis in den sehr hohen Konzentrationsbereich von bis zu 4.000 µg/m³ (Bild 10). Eine schnelle, zuverlässige Rückmeldung sowie eine flexiblen Bedingungen ermöglichten den Betreiber natürlich entsprechende Maßnahmen für die Gasreinigung, um den Grenzwert von Hg-Emissionen zu erreichen. Die Resultate der Testinstallationen zeigen hierbei die Flexibilität des eingesetzten Messverfahrens MERCEM300Z (außen und innen) ohne Leistungs einbußen oder Einschränkungen erfolgreich absolviert.

5. Anwendungsbereich des neuen Messverfahrens

<table>
<thead>
<tr>
<th>Störkomponente</th>
<th>Konzentration</th>
<th>QE auf die Hg-Messung</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO₂</td>
<td>30 mg/m³</td>
<td>0,090 µg/m³</td>
</tr>
<tr>
<td>NO</td>
<td>300 mg/m³</td>
<td>keine QE</td>
</tr>
<tr>
<td>O₂</td>
<td>21 Vol.-%</td>
<td>0,120 µg/m³</td>
</tr>
<tr>
<td>HCl</td>
<td>200 mg/m³</td>
<td>keine QE</td>
</tr>
<tr>
<td>H₂O</td>
<td>30 Vol.-%</td>
<td>0,060 µg/m³</td>
</tr>
<tr>
<td>SO₂</td>
<td>1.000 mg/m³</td>
<td>0,065 µg/m³</td>
</tr>
</tbody>
</table>

Die Tabellen 1 und 2 zeigen die Ergebnisse der Störfaktoren und deren Auswirkung auf die Hg-Messung. Die Tabellen zeigen, dass die Störfaktoren wie NO₂, NO, O₂, HCl, H₂O, SO₂ die Hg-Messung beeinflussen können. Die Störfaktoren werden in der Tabelle 1 aufgeführt, und die Auswirkung auf die Hg-Messung ist in der Tabelle 2 angegeben. Die Tabellen zeigen, dass die Störfaktoren wie NO₂, NO, O₂, HCl, H₂O, SO₂ die Hg-Messung beeinflussen können. Die Störfaktoren werden in der Tabelle 1 aufgeführt, und die Auswirkung auf die Hg-Messung ist in der Tabelle 2 angegeben.
Installation of an SCR-process will in any case become necessary. In this connection the preferred temperature range for the catalyst lies in a range of 220 °C up to 240 °C. This temperature range allows a sufficiently good transformation speed. Problems due to the formation of ammonium sulphate can reliably be excluded, as far as the temperature-dependent $\text{SO}_2$ content in the gas is lower than 10-25 mg/Nm³. Due to the preferred temperature range for the conditioned dry sorption of approximately 130 °C up to 150 °C, a reheating of gases upstream of the catalyst is unavoidable. The reheating of gases can indeed largely be realised by heat recycling around the catalyst, however, the remaining temperature difference of approximately 30 K has to be balanced by an external heat input, e.g. by means of a steam-gas-heat exchanger. A downstream installed heat exchanger located upstream of stack can be used for the heat recovery, but the generated heat has a comparatively poor quality. Figure 8 shows the basic scheme of a corresponding process.

Figure 8: Combination conditioned dry sorption – SCR

If very low limit values are also requested for further pollutants such as acid crude gas pollutants, heavy metals, dioxins/furans, an additional dry sorption stage can be installed downstream of SCR-system. A correspondingly designed and installed plant including the achieved annual average values are shown in Figure 9. Details concerning this plant concept can be gathered from the references [9].
Combination of dry sorption with SCR process

Due to the fact that the separation of acid crude gas pollutants, and in this respect particularly \( \text{SO}_x \), is very efficiently possible by injection of \( \text{NaHCO}_3 \) in a temperature range of 220 °C up to 240 °C, the reheating can be omitted in case of a combination of dry sorption with \( \text{NaHCO}_3 \) and a downstream installed catalyst. Figure 10 shows a possible process variant.

The separation of acid crude gas pollutants takes place in the first dry sorption stage at a temperature of approximately 240 °C by means of injection of \( \text{NaHCO}_3 \). Following this, the ammonia water injection, the mixing section and the catalyst are arranged. In an external economiser installed downstream of catalyst, the gas is cooled down to approx. 140-120 °C. Another dry sorption stage serves for the reliable separation of the acid pollutants still existing in the gas, the heavy metals including mercury as well as dioxins/furans by means of injection of \( \text{Ca(OH)}_2 \) and activated carbon. This arrangement does not only allow the achievement of low \( \text{NO}_x \) and \( \text{NH}_3 \) values, but also ensures a very good separation efficiency for acid crude gases with at the same time low additive powder consumption. However, when evaluating the economic efficiency, the high specific purchase price for \( \text{NaHCO}_3 \) has to be compared to the cost savings resulting from the omission of steam-gas-heat exchanger.

The use of a low temperature catalyst can be an alternative to the above-described process. Due to the operation of SCR at approximately 180 °C up to 200° C, activated carbon can be injected in the dry sorption stage. However, this variant presents the high risk of efficiency loss of catalyst stage due to the formation of ammonium salts. A cyclic regeneration of catalyst by means of gas heating will be necessary.
2.4. Heavy metals as well as dioxins/furans

2.4.1. Heavy metals

Where heavy metals (except for Hg and Hg-compounds) are present in gaseous form due to their steam pressure, they can be converted into particulate compounds by means of chemical reactions with the basic additive powder qualities. In case of a sufficient quantity of basic additive powder qualities, a separation reliably takes place even in case of temperatures higher than 200 °C. Measuring results clearly show that emission limit values to be expected in the future for heavy metals can reliably be achieved by means of injection of Ca- or Na-based additive powder qualities in combination with a particle filter.

The separation of Hg and Hg-compounds will in most of the cases be achieved by adsorption at additive powders with large specific surface. Usually, activated coke and/or activated carbon are used for this purpose. Normally the limit value totalling to 10 μg/Nm³ which is already currently requested as annual average value in Germany, can be achieved with this process.

The continuous measurement of Hg limit values already generally required in Germany and expected for all other EU countries in the future, has led to the fact that many plants have meanwhile been equipped with precautionary measures for the separation of Hg peaks. In this connection especially the additional injection of doped activated carbon in case of increasing emission limit values may be mentioned.
The injection of additional liquid additive agents into an evaporative cooler installed upstream of the conditioned dry sorption system may present a further measure [6]. Even acid scrubbing stages installed downstream of a condition dry sorption system may contribute to the Hg separation.

2.4.2. Dioxins/furans

The emission limit value for dioxins/furans will intensify significantly as a result of revision of WI-BREF (Table 1). There is a large number of measuring results available for the injection of carbonaceous additive powder qualities with large specific surface areas in connection with a bag filter, partly clearly below the range of BATAELs according to Table 1. Nevertheless, individual measurements are also known, showing emission values lower than 0.1 ng/Nm³ which are, however, lying above the upper limit of the reworded BATAELs. In this context a precise operating mode of plant has to be ensured in future in order to avoid an exceeding of emission limit values.

- Low CO-values
- Low particle contents in the clean gas downstream filter
- Adequate injection quantities of carbonaceous additive powder qualities

Multi-stage flue gas cleaning systems are surely an advantage in this respect.

It should also be noted that in the scope of revision of WI-BREF the use of continuous sample taking for the constant monitoring of dioxin/furan emissions is being debated. In this connection experiences are among others available in Belgium.

3. Further major points for discussion concerning WI-BREF

Apart from the emission limit values there are further items which are discussed in the scope of the revision of WI-BREF. The following two major points are discussed in connection with the BATAELs:

**Normal operating conditions (NOCs) und others than normal operating conditions (OTNOCs)**

According to IED [4], the emission limit values are referring to the normal operating conditions. However, the IED is making an exception with regard to waste incinerators and refers in this context to the effective operating time as basis for the observance of emission limit values. The effective operating time comprises a larger operational range and can also include others than normal operating conditions. Due to the fact that the draft does not provide a clear allocation, there might be a need for discussions in the future concerning the granting of approvals.

The above-mentioned continuous sample taking in connection with dioxins/furans is an example for this. The question arises, when the measurement has to be connected, e.g. during cold start-up of a incineration line, and which further operating conditions will be evaluated as OTNOCs. The discussion has not been finalised in this respect.
Measuring uncertainty

Particularly the lower end of BATAELs range is subject to the risk that measuring tolerances, as requested in the IED, cannot be achieved, thus presenting a high measuring uncertainty for these values (Figure 11).

![Figure 11: Measurements uncertainties](image)

It is important to make sure that the new WI-BREF will comprise a definitive clarification. Based on the current state of discussion, the WI-BREF will contain a reference concerning the observance of the measuring uncertainty. The question, however, remains open, whether this reference will also be included in chapter 5 (BAT Conclusions). Nevertheless this will absolutely be necessary as only this part has to be transferred into national law. [3]

4. Personal assessment

The whole range of BATAELs to be expected in the scope of revision of WI-BREF can reliably be achieved with the available process-related solutions for the flue gas cleaning in the field of waste-to-energy. However, in many cases multi-stage and - in comparison to today’s plants - more complex systems will have to be used. The disadvantage of higher investment costs frequently associated with this, will in many cases be at least partially be compensated by lower operating costs.

It remains to be seen which limit values will each be stipulated in national law as binding values by the separate member states of the EU. Even if, however, the upper end of BATAELs ranges will be taken as basis in this context, the lower values will in all probability be discussed in the scope of public participation during approval procedures for new plants.

From the author’s point of view it will definitely be necessary that not only the BATAELs but also further items will be defined precisely in the final version of WI-BREF and particularly in the BAT Conclusions. This refers among other things to the discussion about measuring uncertainty and to NOC and/or OTNOC.
Finally, it has to be noted that there are still considerable differences among the member states of the EU concerning the handling of thermally recyclable residues (Figure 12 [2]). Even if the statistic is based on an investigation in 2015 and although changes have been realised in the meantime in some countries, as e.g. Great Britain and Finland, regarding the reduction of landfilling, the statistic is still correct generally. There is still a large number of countries in which thermally reusable residues, which can no longer be recycled, are partly or completely deposited. With regard to the effects on the environment, the installation of waste-to-energy plants with limit values at the upper end of BATAELs will in this connection surely be better than the further landfilling of these materials, on the grounds that thermal recycling plants are not financially feasible.

Figure 12: Shares of recycling, WTE and landfill in Europe

5. References


Influence of New WI-BREF on the Concepts of Flue Gas Cleaning in the Future – What Will Change?


[11] Margraf, R.: TwinSorp® – a simple process for increased requirements on the emission limit values i. a. for waste and RDF incinerators, considering the energy efficiencycommand, 6th symposium; Dry crude gas cleaning for solid fuel firings and thermal process technology, Haus der Technik Essen, 2010


[14] Technical Working Group (tWG) Draft conclusions of the Final Meeting or the review of the BAT reference document on Waste Incineration (WI BREF), European IPPC Bureau, Seville, 23.–27. April 2018


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The actual book 2016|2017 carries forward the survey of waste-to-energy plants in the Federal Republic of Germany which started in the 1990’s. With the first publication we have two books which complement each other perfectly. Both books provide extensive information about the installed technology and the environmental impact of the waste-to-energy plants. The quality of the new inquiry has been extended in terms of the technical data. Existing gaps regarding the data were partially filled.

This is the result from the considerable assistance of numerous plant operators. The publication on hand shall be seen as an interim report. The work on the data acquisition will be continued. For this reason we ask plant operators and manufactures to critically review the release data.

- 33 municipal solid waste incineration plant
- 7 solid recovered fuel power plant
- 1 Sonderabfallverbrennungsanlage

The further investigations will be extended to the missing German waste-to-energy plants as well as to plants in other countries.