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NEW APPROCHES REGARDING BAT CONCLUSION IMPLEMENTATION

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Abstract

This paper presents some synthetic information regarding preliminary data obtained along a multiple objective research project in which the principal objective was new approaches regarding the implementation of pollutant air emissions -Directive 2010/75/UE, with the necessity coming to adopt the European Commission's decisions on BAT Conclusions. In that study are presented the novelty elements becoming from both important National Economy domains, such as Large Combustion Plants and Intensive pig and chicken farming; beside these theoretical aspects are presented in the paper also the first air emissions results such as HCl, HF and Hg resulting from charcoal combustion related with an experimental model that could be used in the Smell Management Plan development in the field of Intensive Animal farming, required by the BAT conclusions.

Keywords: *air pollution, BAT-AELs, BAT conclusions, large combustion plants*

Introduction

The air pollution and implicitly, the emissions reduction from anthropogenic sources is a constant concern of the authorities, the scientific environment and of the population due to the important health impact it can have it on the people (Bucur & Danet 2016) and the influence on the other environmental factors with which they are in direct interdependence. Maintaining air quality requires first and foremost is the use of the best manufacturing techniques and technologies coupled with the most efficient methods/techniques to reduce pollutant emissions from the environment. BAT (BATC) conclusions as are defined (Directive 2010/75/EU), are the key element of BAT reference documents and establish the conclusions of the best available techniques, their description and also the information to assess their applicability, emission levels associated with the best available techniques, associated monitoring, consumption levels and where appropriate relevant site remedial measures. Till present, based on European Commission Decisions have been adopted the BAT Conclusions for 12 activity sectors (Table 1), but the process is ongoing to perform all the IPPC Directive areas. In the Table 1 are also indicated

the implementing deadlines for the provided measures from the Directive (Implementing Decision 2017/302/EU), (Implementing Decision 2017/1442/EU). In addition to a brief information presentation compared with the BREF/BAT documents, the BAT Conclusions also specify the most important techniques to reduce these emissions - the techniques are presented in the table format without insisting on their detailed description as well as the techniques/methods indicated for air and water pollutants emissions from monitoring process.

Table 1. Activity domains for which they were adopted the BAT Conclusions

Activity domains	Date of adoption	Implementation deadline
<i>Cast, iron and steel production</i>	28.02.2012	2016
<i>Glass manufacture</i>	28.02.2012	
<i>Chloralkali production</i>	9.12.2013	2017
<i>Cement, lime and magnesium oxide production</i>	26.03.2013	
<i>Hides tanning</i>	11.02.2013	2018
<i>Mineral oil and gas refining</i>	9.10.2014	
<i>Cellulose, paper and cardboard production</i>	26.09.2014	2019
<i>Wood based panels production</i>	20.11.2015	
<i>Common systems for the treatment / management of waste water and waste gases in the chemical sector</i>	30.05.2016	2020
<i>Nonferrous metal industry</i>	13.06.2016	2021
<i>Intensive chicken and pig farming</i>	15.02.2017	
<i>Large combustion Plants</i>	31.07.2017	

In this paper approaches are discussed the novelties in the field of large combustion plants based on charcoal and the odour evaluation in the intensive pigs and chicken farming;

Large combustion plants are plants with a total rated thermal input bigger or equal to 50 MW, irrespective of the type of fuel, solid, liquid or gaseous used for generating electricity and/or heat. One of the major environmental problems generated by the operation is the air emissions of SO_x, NO_x, CO, dust and also greenhouse gases such as N₂O and CO₂ (Barbu et al 2015, Danciulescu et al 2017) and small quantities of heavy metals (Petrescu et al 2017), halogenated compounds and dioxins, furans, depending on the chemical composition of the fuel used, the operating regime and applied emission reduction technologies (Nicolescu et al 2017, Serbanescu et al 2017).

Taking into account the specific requirements of the BAT Conclusions, the first results obtained in the process of assessing the emission of HCl, HF and mercury in case of large combustion plants based on charcoal are also presented.

Materials and Methods

In order to determine the concentration of HCl, HF and mercury from the fixed source emissions resulting from large combustion installations based on charcoal, where respected the provisions of the standard method recommended by the BAT Conclusions (Table 2), which require isokinetic sampling of air, with the retention of pollutants on filter and absorbent solutions specific to each compound, followed by analysis by atomic absorption spectrometry with cold vapour for mercury, electrochemical method for HF and spectrophotometrical method for HCl

Table 2. HCl, HF and Hg determination methods for the fixed sources emissions

Polutant	Determination Method
HCl	SR EN 1911:2011 fixed sources emissions. Determination of the mass concentration of gaseous chlorine, expressed as HCl. Standard reference method
HF	SR ISO 15713: 2008 fixed sources emissions. Sampling and determination of fluorine gaseous form content.
Hg	SR EN 13211: 2003 Air quality. Emissions from fixed sources. Manual method for total mercury concentration determination.

Results and Discussion

By carefully reviewing the BAT Conclusions, some novelty elements with general applicability have been identified such as: 1) Increasing the continuous monitoring measurements versus periodic measurements; 2) Usually are recommend daily measurements for continuous monitoring and during minimum 30 minutes for periodical measurements; 3) the tendency to lower emission limit values; important reductions are observed in large combustion plants; but also in the other analyzed areas; 4) the possibility of using, under certain conditions, indirect methods of monitoring the air emission pollutants, which have the advantage of simplicity and reduced costs, and specific novelties with applicability only in certain areas: a) the NH₃ air emissions into in the field of intensive pigs and chicken farming, dosed in kg of NH₃/animal/year space, which implies the development of distinct measurement and evaluation methodologies, b) the elaboration of the Smell Management Plans for the case of complaints, with applicability in the field of intensive pig and chicken farming and for the production of wood-based panels. The paper approaches with novelty issues regarding large combustion plants.

Large combustion plants

Regarding the Large Combustion Plant field, the lower limits were compared to those of the current legislation and were introduced (Table 3), values which raises a number of problems regarding how these requirements can be met. The experience of the other states in solving similar situations indicates three type of approaches: i) the optimization of existing processes, ii) partial change of existing technological processes, iii) essential or total change of the initial process, depending on the specificity of the process and the costs of the investment. Generally, air emissions

for these compounds are continuously monitored knowing exactly the current existing level.

Table 3. Limit values for coal and lignite air emissions

Capacity (MWt)	SO ₂ , mg/Nm ³		NO _x , mg/Nm ³		Dust, mg/Nm ³	
	New instalation	Existing instalation	New instalation	Existing instalation	New instalation	Existing instalation
	s	s	s	s	s	s
	Annual average					
50-100	150-200	150-360	100—150	100—270	2-5	2-18
100-300	80-150	95-200	50-100	100-180	2-5	2-14
>300	10-75	10-130	50 - 85	< 85 - 150	2-5	2-10
	Average daily					
50-100	170-220	170-400	155—200	165—330	4-16	4-22
100-300	135-200	135-220	80—130	155—210	3-15	4-22
>300	25-110	25 - 165	80 -125	140 - 165	3-10	3-11
Law 278/2013	400/250/200		300/450/200		30/25/20	

It was also notes the introduction of new requirements for the monitoring of the HCl, HF and mercury emissions, which were not regulated until now in environmental legislation. In Table 4 are presented the limit values for these pollutants emission and for each, annual limit values it have been set.

Table 4 Annual limit values for coal and lignite air emissions

Capacity (MWt)	CO ₂ , mg/Nm ³	HCl, mg/Nm ³		HF, mg/Nm ³		Hg ₂ , µg/Nm ³	
	Existing instalatios	New instalatio ns	Existing instalatio ns	New instalatio ns	Existing instalatio ns	New instalatio ns	New instalatio ns
<300	< 30-140	-	-	-	-	1-5	1-10
≥300	5-100	-	-	-	-	1-4	1-7
<100	-	1-6	2-10	<1-3	<1-6	-	-
≥100	-	1-3	1-5	<1-2	<1-3	-	-

The compliance with these requirements raises special issues for plant process operators from Romania, in order to reduce pollutant emissions for which the limits it have been reduced (NO_x, SO₂ and dust) and measures to quantify the level of current HCl, HF and Hg emissions in view of compliance.

For a punctual estimation of HCl, HF and Hg emissions in July 2018, a series of momentary measurements were performed on four Large Combustion Plant LCPs based on carchoal installations which, for the regulated indicators (Law 278/2013), are within the required limits. The results of these determinations are described in Table 5.

Table 5 Preliminary results for HCl, HF and Hg exposed in mg, $\mu\text{g}/\text{Nm}^3$, based on momentary measurements

Installation	HF, mg/Nm^3	HCl, mg/Nm^3	Hg, $\mu\text{g}/\text{Nm}^3$	Observations
1	1.03	1.19	3.7	the values are in the admitted limits
2	18.6	1.28	2.3	the limit of HF is over the admitted limit
3	22.6	2.02	3.8	the limit of HF is over the admitted limit
4	1.81	1.91	4.9	the values are in the admitted limits
BAT-AEL	1-3	1-5	1-10	the values are in the annual average admitted limits

Analysing the obtained results we can observe that for Hg and HCl the momentary concentration measurements levels for all 4 LCPs, are situated into the admitted emission limits for BAT for that kind of pollutants. For the HF determinations, two measurements out of the four performed, we find values that exceed the limits imposed by the BAT Conclusions; taking into account that the values obtained are momentary values and the emission level varies over time, for a more exact estimation, it is necessary to carry out a larger number of measurements covering a 1 year period, at least for the sources and indicators to which exceedances have been identified. Interesting would be also the verification of the fluorine content of the burned fuel at the sampling time.

Intensive pigs and chicken farming

According to the BAT Conclusions on Intensive Pig and Chicken farming, some novelty elements are identified regarding the monitored pollutants, reporting units, frequency and the mediation period, but the most important provision relates to odour level and the Smell Management Conditions. In order to prevent or, where this is not possible, to reduce the odour emissions by farming of produced, BAT consists in the design, implementation and periodic review of an Odor Management Plan. Starting from the provisions of the BATC regarding measures aimed at reducing the level of odor generated by some activities, we propose an experimental model comprising the steps and activities needed to elaborate the Smell Management Plan presented in Figure 1:

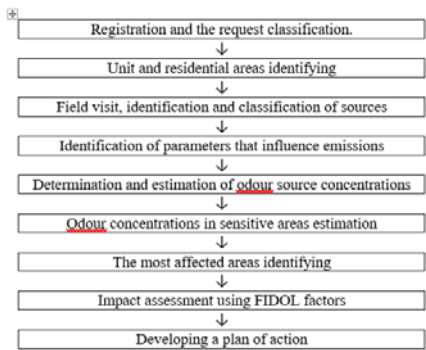


Figure 1. Diagram of the Experimental Model for the Smell Management Plan elaboration.

The first four stages are dedicated to identifying and quantifying, as far as possible, starting from the existing data, the technological steps that can influence the air quality, sensitive areas, emission sources, and fit the demand according to the proposed objectives: the concern of economical agent to reduce emissions, obligations imposed by environmental authorities, complaints coming from residential areas. If will be necessary, the next step involves measuring/estimating by direct measurements or by mathematical modeling of the odour concentration and identification of the most affected areas, and the last stage is intended to assess the impact and achieve an Action Plan designed to reduce the pollution smell level within the desired limits.

For the odour concentration determination, for the conducted emission sources, the dynamic olfactometry method is applied, SR EN 13725: 2003 (Vasile et al 2017). For sources whose emissions can not be quantified by direct measurements, emission factors or assessments by indirect methods may be used to estimate odour emissions.

Conclusions

As it results from the BAT Conclusions adopted, the emission limits in the new imposed areas, for the concentration of chemical pollutants, lower than in current regulations, require, at least in the case of Large Combustion Plants based on charcoal, measures aimed at optimizing, partially modifying or changing current technology processes or improving the efficiency of reduction systems. For newly introduced indicators in the regulations, the first step is to establish the current emission level, depending on, if will or not be applied the reduction measures.

The results of the preliminary tests conducted on four emission sources corresponding to four LCPs based on charcoal, it have revealed both concentrations

within limits and values that are above the annual limit, which requires further testing to achieve an appropriate mediation.

Concerning the intensive pigs and chickens farming, the smell and its evaluation represent the novelty element imposed for managing, in order to reduce the levels, but without assign limiting values. The experimental model exposed in the paper represents a first step in the smell process assessing and also for implementing the Smell Management Plan requested by BAT Conclusions.

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