Comparison Access to Odor Problems in Selected European Countries

Josef DOUŠA[1)]

[1)] VŠB-Technical University of Ostrava, Faculty of Mining and Geology, 17. listopadu Str. 15, 708 33 Ostrava - Poruba, Czech Republic; email: josef.dousa.st@vsb.cz

http://doi.org/10.29227/IM-2019-01-15

Submission date: *11-07-2018* | Review date: *02-04-2019*

Abstract

The effects of odor are not only annoying but can also cause serious health problems, resulting in an impact on the overall quality of the environment.

Most European jurisdictions classify odor as an atmospheric pollutant and regulate it at various levels of government. This paper summarizes the approach of selected European countries to this issue, comparison in terms of acceptable concentrations, comparison of instruments used in individual countries, requirements for the application of BAT technologies that ultimately lead to the reduction of odor emissions. Further are described, the basic features of odors, units, methods of analysis and dispersion´s modeling, application of odor removal technologies, with emphasis in relation to the Czech Republic.

Keywords: odors, odors jurisdiction, odors emission

Introduction

To understand odors issues, it is necessary first to clarify the concepts and influences that are related to the perception of odors. Odor can be characterized by concentration, intensity (perception), hedonic phenomenon (whether the odor is pleasant or unpleasant) and exposure time. The odor concentration is expressed by the amount of odorous substances in m3 and is the number of times the smear sample must be diluted with pure air to reach the smell threshold, that is, the odor value for the first time. If the odor concentration on the source is 100 ouE × m^{-3}, this means that if the air is diluted 100 times, odor will not be noticeable, will not be felt. One odor unit is the olfactory threshold, when we register a change in the nature of the air, but we do not have to know what types of odors it is. The average person registers up to 3 ouE × m^{-3}, with the value of 5 ouE × m^{-3} being able to describe the smell (for example, if it smells coffee, chocolate, or smell of decaying leaves).

Odor is a commonly complicated mixture of gaseous compounds and has a specific profile. The interaction between the odor and the concentrations of the individual components in the mixture alters the perceived strength of the mixture, and there are models that try to explain such phenomena as masking, countermeasures, neutralization, addition, synergism, etc. The lowest concentration levels at which chemicals cause irritant effects in humans to be below the level of the olfactory threshold, although the perception of odor prevents irritation in many industrial chemicals.

With regard to the construction and configuration of odor sources, it is possible to differentiate between sources with measurable airflow (active sources) and sources that emit odors but have no measurable external airflow (passive sources). The methodology for measuring odor concentration is very well defined in EN 13725 (in Czech Republic – ČSN EN 13725, 2003). This standard is recognized in odors detail throughout the world, or in Europe. This method is very repeatable and reproducible, and quite well standardizes the determination of odor concentration. This odor concentration determination provides directly comparable data on different types of odor and can be used as input for dispersion models, to determine the impact of odor from the point of view of annoyance and to assess the effectiveness of odor control measures.

Description

The following section describes the approach of state administrations of European states to the problem of odors as air pollutants. The selected countries represent: Germany, Austria, France, Spain, Italy, Ireland, Norway, Denmark, Netherlands, Belgium and Czech Republic.

In Germany, air quality is based on the provisions adopted by the European Union (EU) and subsequently implemented in German law. This ensures the consistency of EU and German legislation on air quality. In addition, the provisions on air quality control – the Act on prevention of environmental damage caused by air pollution, noise, vibrations and similar phenomena, on the basis of the Immunity Protection Act (BImSchG – Bundes Immissionsschutz Gesetz) and its administrative regulations, are in force at national level the implementing regulations governing mainly air quality control in Germany. All types of odors produced from any commercial device are considered to be annoying or unpleasant according to the BimSchG. Technical provisions on air quality control (TA-Luft, 2002, amendment 2017) are a tool for managing air pollution rates. The objective of TA-Luft is to protect the population and all environments from the harmful effects of air pollution and to provide preventive measures against the adverse effects of air pollution in order to achieve a high level of environmental protection. It includes, inter alia, a directive on preventive measures against environmen-

Tab. 1. Overview of individual criteria in selected countries

Tab. 1. Przegląd poszczególnych kryteriów w wybranych krajach

Competence	Odor criteria		Average time	Peak factor	Level of protection	
	c_t [odor units]	Percentile [%]				
Germany	1	98	1 s	4	irrelevant criterion	
		90			mixed and residential areas	
		85			agricultural, industrial and commercial areas	
Austria	1	97	1 – 5 s		spa areas	
	1 and 5 - 8	92 and 97			residential areas	
France	5	98	1 h	1	composting devices	
	5	98			constructions	exist devices
	5	99.5				new devices
Spain						
Catalonia	3	98	1 h	1	most unpleasant	
	5				moderately unpleasant	
	7				less unpleasant	
Italy						
Lombardy	1	98		2.3	new and exist devices	
	3					
	5					
Puglia	1, 2, 3, 4, …	98		2.3	new and exist devices	
		99.9				
		100				
	1	97	1 – 5 s			
	1 and 5 - 8	92 and 97				
Ireland	1.5	98	1 h	1	all options	
	3				new equipments for pig breeding	
	6				existing equipments for pig breeding	
Norway	1	99	1 h	1	residential areas + neighborhood	
	2				industrial areas + neighborhood	
Denmark	5 – 10	99	1 min.	7.8	industrial areas	
	5	99	1 h	1	livestock farming	residential areas
	7					countryside
	15					individual

Competence	Odor criteria	Average time	Average time	Peak factor	Level of protection
	c_t [odor units]	Percentile [%]			
Netherlands					
Dutch emission limits are custom-tailored according to individual industries (eg coffee roasting, asphalt mixing, slaughterhouses, etc.)					
North Brabant South Holland Flevoland Gelderland Overijssel Groningen Zealand	0.05 - 100	95 – 99.99	1 h	1	industrial new and exist devices, with value, including consideration hedonic phenomenon
Belgium					
Walloon	3	98	1 h	1	composting devices near habitation
	6				pig breeding
	10				poultry farming
Czech Republic					
	N/A				regional authority

tal damage caused by odors. (Jarass. 2015) However, TA-Luft does not set protection criteria or odor limits. This is covered by a specific national regulation called the Guideline on Odor and Ambient Air (GOAA, 2008).

GOAA deals with odors generated in industrial and animal establishments, but do not cover smells arising from household heating, road transport, manure spreading, vegetation and similar sources. The criteria outlined in this document are based on the determination of the recognizable odor and the overall odor concept. Odor in ambient air can only be detected if it can be determined by field measurements or determined in exposure estimates of dispersion models. (GOAA, 2008)

In Austria, the juristic system is divided between the thresholds that have a lawful basis and the target values that are only based on guidelines without a lawful basis. Only for spa treatment areas there is a limit value consisting of a percentile probability of 3% or a concentration threshold Ct = 1 ouE × m^{-3} (similarly to Germany). The Austrian Academy of Sciences (OAW, 1994) issued instruction with two limit val-

ues in 1994 (both of which must be considered as a more percentile criterion). However, it is proposed only subjectively.

The Air Quality Regulation in France is governed primarily by European Parliament directives, namely Directive 2008/50/EC on ambient air quality and cleaner air for Europe and Directive 2001/81/EC (NEC Directive) on national emission ceilings for certain air pollutants. French national legislation is based on Law No 96-1236 of 30 December 1996 on aviation and rational use of energy (LAURE), codified in the Environmental Code. Legislative and regulatory provisions on air quality are contained in paragraph II. Air and atmosphere II. books of the environmental code (Articles L220-1 to L228-3 and R221-1 to D228-1). (Brancher et al., 2017)

Spain has no specific federal-level tools for issuing emissions laws on odors. In general, odors are subjectively regulated by federal environmental laws. The Spanish regulation is still in the beginning and is based on municipal regulations or operating permits. (Brancher et al., 2017) Only in Catalonia, the local environment and housing department drafted a draft law on odor pollution in 2005. This proposal seeks to add new assessment tools used in other countries and conduct odor control campaigns in different facilities so that a future standard for Spanish territory. According to this proposal, odor emissions are measured for existing activities in accordance with UNEEN 13725: 2004. For new activities, emission estimates are achieved using emission factors.

Italy does not include specific criteria for environmental odors at national level. As regards odor pollution, the Italian Environmental Code does not set any limits by means of Legislative Decree 152: 2006. In the Italian legal system, Integrated Environmental Authorization is the implementation of the European IPPC. Italian regions have the autonomy to regulate air quality, with the exception of the following regions: Basilicata, Abruzzo, Emilia Romagna, Sicilia (Brancher et al., 2017), basically the maximum emission limits for composting and biogas stations. The Lombardy Region, one of the twenty administrative regions of Italy, published a special odor control with a maximum impact value based on the frequency of crossing this limits values.

In Ireland, the following air quality legislation is applied according to EPA Ireland (EPA, 2018): the Environmental Protection Act 1992 (as amended); Waste Management Act 1996 (as amended); Environmental Protection Act 2003 (as amended); Air Pollution Act 1987 (as amended) and Irish Directive SI No. 787 of 2005 – Sewage Treatment (Odor and Noise Prevention). Currently, there is no general legal regulation on odors concerning industrial equipment in Ireland. However, EPA Ireland (EPA, 2018) defined guidelines for intensive agricultural activities setting limits for pig breeding.

In Norway, odors are dealt with under the Law – Protection against Pollution (Law No 6 of 13th March 1981 Pollution and Waste Protection), where Chapter 3 provides for authorization for any activity that could cause pollution. The Directive TA-3019: 2013 was developed to assess the effects of odors. In general, the Guidelines set out a framework for: assessing the risk of odor, operation and activity and odor control plan. Odor risk assessment should describe the potential of odor at each stage of the process: map odor sources, determine odor emission levels, and promote dispersion modeling to simulate odors. Odor risk assessment in Norway is based on the KVALUR method, which is used in conjunction with norm NS 5814. The purpose of the method is to determine the risk of odor as an index and to indicate whether episodes of odor could be considered relevant to the affected receptor. (Brancher et al., 2017)

In Denmark, two different types of equipment are assessed to assess the impact of odors: one focuses on industrial emissions and the other on livestock. A detailed description of the procedures applied in Denmark with respect to air quality emissions can be found in the Guidelines for Air Emissions Control - Air Pollution Control of Equipment. The Danish unit of odor, Lugtenheder (LE), is almost equivalent to ouE × m^{-3} because it uses the same samples dilution. (DEPA, 2002)

The Netherlands access to odor problems has the longest history around Europe. In the Netherlands, environmental directives on air pollution are implemented in the Environmental Protection Act (Wet Milieubeheer) and the Environmental Protection Regulation (Activiteitenbesluit milieubeheer).

The Industrial Emissions Directive (IED 2010/75 / EU) regulating emissions from large industrial sources is also implemented in the Activity Decree. This Directive lays down rules for large combustion plants, waste incineration plants, VOC solvents and IPPC facilities. Emissions that are not covered by the generally binding rules of the Decree are subject to authorization. The general principle of Dutch odor policy is to minimize odor pollution and prevent new pollution. This principle, together with the use of BAT, is a main element of the odor policy in the Netherlands.

In the Netherlands since 2004, the odor thresholds are measured according to European Standard EN 13725: 2003 (EN13725, 2003). The European Standard was introduced in this country as NEN-EN 13725: 2003.

Local authorities in individual provinces can regulate the interpretation of national odor politics.

In this regard, for example, the provinces of North Brabant, South Holland, Flevoland, Gelderland, Overijssel, Groningen and Zealand have their own regulatory framework.

In Belgium, the Odor Emissions Regulation is set at the national level. Basically, the regulatory framework is set for impact criteria for the Flemish and Walloon regions. Objective determination of the odors concentration of the gaseous sample by means of dynamic olfactometry with human evaluators is performed using the national standard NBN EN 13725: 2003. (Brancher, 2017)

In the Czech Republic, basic environmental protection is implemented in Act No. 17/1992 Coll.,

On the Environment, which defines the formation of natural conditions for the existence of all organisms. (Tuháček and Jelínková, 2015) Odor protection is further specified in Act No. 201/2012 Coll., On air protection in § 2 letter b) where: "a pollutant is any substance that has a presence in the air or can have harmful effects on human health or the environment, or annoys the odor" (UZ1223, 2017) At present the executive power to evaluate odor emissions is left at the level of regional authorities for both new installations and the assessment of existing facilities.

The assessment of the odor load can take place on the basis of several procedures: physico-chemical and analytical procedures; Olfactometric method, which is well described in ČSN EN 13725 (EN implementation); statistical methods

- questionnaire surveys according to ČSN EN 16841-1, „odor feet“ measurement according to ČSN EN 16841-2, or an increasingly popular “electronic nose”.

Results and discussion, Conclusion

As can be seen from Table 1, most European countries have legislated thresholds for odors and their implementation (location, classification, etc.). Concerning the variance of the values, considerable differentiation (values of 1–100 ouE) is evident as well as the percentile evaluation approach (85–99.9%). The guidelines drawn up for impact assessments in individual European countries lead to suppressing causes at a tolerable level other than zero odor values. As the essence of the complexity of the odors itself is, the regulation itself is complicated. A positive factor is that judging at individual jurisdictions takes into account individual cases according to predefined criteria.

However, there are no limits in the Czech Republic, so the assessment at regional authority level remains, and only on the subjective approach of individual regions. What is the key to the long-term success of environmental odor control? An unambiguous response (not only for the Czech Republic) is the introduction of clear and objective smell rules based on an integrated strategy.

Literatura – References

1. BRANCHER, M.; GRIFFITHS, K.D.; FRANCO, D. a DE MELO LISBOA, H. A review of odour impact criteria in selected countries around the world. Chemosphere [online]. 2017, 168, 1531-1570 [cit. 2018-01-30]. DOI: 10.1016/j.chemosphere.2016.11.160. ISSN 00456535. Dostupné z: http://linkinghub.elsevier.com/retrieve/pii/S0045653516317064
2. ČSN EN 13725. Kvalita ovzduší - Stanovení koncentrace pachových látek dynamickou olfaktometrií. 1. Praha: Český normalizační institut, 2003.
3. DEPA: The Danish Environmental Protection Agency. Guidelines for Air Emission Regulation, Copenhagen, Denmark: DEPA, 2002 [cit. 2018-03-19].
4. EPA: Environmental Protection Agency [online]. Wexfor, Ireland: EPA, 2018 [cit. 2018-03-18]. Dostupné z: https://www.epa.ie
5. GOAA, 2008. Guideline on Odour in Ambient Air GOAA. Detection and Assessment of Odour in Ambient Air. Second Version, Berlin, Germany, 2008
6. JARASS, Hans D. Bundes-Immissionsschutzgesetz: Kommentar unter Berücksichtigung der Bundes-Immissionsschutzverordnungen, der TA Luft sowie der TA Lärm. 11., vollständig überarbeitete Auflage. München: C.H. Beck, 2015. ISBN 978-3-406-68192-9.
7. OAW, 1994. Umweltwissenschaftliche Grundlagen und Zielsetzungen im Rahmendes Nationalen Umweltplans für die Bereiche Klima, Luft, Geruch und Larm. In:Osterreichische Akademie der Wis-senschaften (Ed.), Kommission für Reinhaltung der Luft. Bundesministeriums für Umwelt, Jugend und Familie, Wien, 1994
8. TA-Luft, 2002 Technical Instructions on Air Quality Control – TA Luft: Technische Anleitung zur Reinhaltung der Luft – TA Luft [online]. 2002, , 252 [cit. 2018-02-24]. Dostupné z: http://www.bmu.de/fileadmin/Daten_BMU/Download_PDF/Luft/taluft_engl.pdf
9. TUHÁČEK, Miloš a Jitka JELÍNKOVÁ. Právo životního prostředí: praktický průvodce. Praha: Grada, 2015. Právo pro každého (Grada). ISBN 978-80-247-5464-2.
10. VDI, 2006. Verein Deutscher Ingenieure. VDI 3940 Part 1: Measurement of Odour Impact by Field Inspection; Measurement of the Impact Frequency of Recognizable Odours, Grid Measurement. Beuth Verlag GmbH, Berlin, Germany, 2006
11. Životní prostředí: texty zákonů k 1. 11. 2017 a od 1. 1. 2018: zásadní změny zákona o posuzování vlivů na životní prostředí od 1. 11. 2017, změny 23 zákonů v souvislosti s novou úpravou přestupků. Ostrava: Sagit, 2003, 2017(1223). ÚZ. ISBN 978-80-7488-255-5.

Porównanie podejścia do problemów odorów w wybranych krajach europejskich

Skutki nieprzyjemnego zapachu są nie tylko irytujące, ale mogą również powodować poważne problemy zdrowotne, co wpływa na ogólną jakość środowiska.

Większość europejskich jurysdykcji klasyfikuje odory jako zanieczyszczenia atmosferyczne i reguluje je na różnych szczeblach władzy. W niniejszym artykule podsumowano podejście wybranych krajów europejskich do tego problemu, porównanie pod względem dopuszczalnych stężeń, porównanie instrumentów stosowanych w poszczególnych krajach, wymagania dotyczące stosowania technologii BAT, które ostatecznie prowadzą do zmniejszenia emisji zapachów. Dalej opisano podstawowe cechy zapachów, jednostki, metody analizy i sposobu rozpraszania, zastosowanie technologii usuwania zapachów, ze szczególnym uwzględnieniem Republiki Czeskiej.

Słowa kluczowe: zapachy, odory, prawodawstwo odorowe, emisja zapachów