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STANDARDISATION MANDATE TO CEN, CENELEC AND ETSI UNDER DIRECTIVE 2010/75/EU FOR A EUROPEAN STANDARD METHOD TO DETERMINE FUGITIVE AND DIFFUSE EMISSIONS OF VOLATILE ORGANIC COMPOUNDS (VOC) FROM CERTAIN INDUSTRIAL SOURCES TO THE ATMOSPHERE

1. OBJECTIVE

The Commission requests European standardisation organisations CEN, CENELEC and ETSI (hereafter the ESOs) to develop and validate a new European standard to determine quantitatively the emissions to the air of volatile organic compounds (VOC) from diffuse and fugitive sources, in particular due to the storage, transfer and handling (loading/unloading) of such compounds, within certain industrial sectors.

1.1. Relevance of VOC emissions

For the purpose of this mandate, VOC are defined as in Directive 2010/75/EU.

'Organic compound' means any compound containing at least the element carbon and one or more hydrogen, halogens, oxygen, sulphur, phosphorous, silicon or nitrogen, with the exception of carbon oxides and inorganic carbonates and bicarbonates. 'Volatile organic compound (VOC)' means any organic compound having a vapour pressure of 0.01 kPa or more at 293.15 K, or having the corresponding volatility under the conditions of use.

Emissions of VOC contribute significantly to the photochemical formation in the atmosphere of ozone and other pollutants, which are detrimental to human health and damaging the environment.

VOC are emitted by a wide range of sources, including biogenic sources, transport, industrial processes using VOC (organic solvents and others), associated storage and handling activities and the industrial and domestic use of VOC-containing products.

Due to their volatile nature, VOC are emitted to a significant extent from fugitive and diffuse sources (i.e. other than point sources). This creates a challenge for the accurate determination of VOC emissions and requires specific measurement and estimation methods, which are currently not standardised.

Improving the determination of diffuse and fugitive VOC emissions should help to assess VOC losses during storage and handling and provide an incentive for implementing and improving measures to reduce such losses and the resulting emissions.

2. POLICY AND LEGAL FRAMEWORK

Following the environmental protection objectives laid down in the Article 11 and Article 191 of the Consolidated Version of the Treaty on the Functioning of the European Union (ex Article 6 and Article 174 of TEC (Nice)), several Directives have been adopted to tackle the pollution caused by the operation of industrial activities. The package of industrial emissions legislation has recently been recast and integrated into the Industrial Emissions Directive 2010/75/EU.

The control of VOC emissions to the atmosphere due to losses during storage or transport is covered by the EU legislation and international protocols. The legislation concerning industrial emissions (IPPC Directive 2008/1/EC, to be replaced by Directive 2010/75/EU on industrial emissions) is complemented by the Best Available Techniques (BAT) Reference documents (BREFs), including BAT conclusions, which set out at the EU level what are the BAT for defined industrial activities and/or across those activities. Several BREFs also cover the prevention and control of fugitive and diffuse emissions of VOC from storage and transfer activities, in particular the documents concerning mineral oil and gas refineries and the large volume organic chemicals industry, as well as the 'horizontal' BREF on the emissions from storage. This mandate asks the ESO to develop a voluntary European standard which can be used in the determination of VOC emissions to be regulated within the permits to be issued according to these Directives.

Total VOC emissions are also regulated at the EU and Member States level, in particular under Directive 2001/81/EC (National Emission Ceilings Directive), which sets total emission ceilings for such emissions, to be met from 2010 on.

In addition, under the UN-ECE Convention on Long-Range Transboundary Air Pollution (CLRTAP), protocols have been adopted that regulate VOC emissions, in particular the 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone.

A list of the relevant EU regulations and other published documents relevant to this standardisation mandate is given in the Annex.

3. DESCRIPTION OF THE MANDATED WORK

The Commission requests the ESOs to develop and validate a European standard for the determination of fugitive and diffuse emissions of VOC to the atmosphere from certain industrial sources.

Scope and structure of the standard

This standard shall include the following elements:

1. Scope of the standard
2. Normative references

3. Terms and definitions
4. Principles of the measurement methods and estimation methods to be used
5. Measurement methods and estimation methods to be used and their requirements for calibration and quality control before use;
6. Objectives for the measurement exercise and for the preparatory field work
7. Field operations required:
 - A measurement plan for using the different analytical methods;
 - Sampling methodology - where required;
 - Setting up of the measurement methods on site;
 - Initial quality checks required;
 - Regular quality checks required during the measurement exercise;
 - Final quality checks at the end of the exercise;
 - Methodology for processing of the data obtained and for the expressions of the results;
 - Critique and comparison of the results of the different methods;
 - Estimates of the measurement uncertainty of the monitoring methods;
8. Reporting requirements.

The standard is required to support legislation as given in Section 2.2 and the Annex.

The standard shall be validated in the field using representative industrial sites that are encompassed by this mandate, and suitable emission sources therein, using the monitoring methods, estimation and calculation procedures as set out below.

The standard should be as general in its applicability as is practical, so that the determined emissions are comparable and harmonized across the relevant and different industrial sectors, and therefore current and future emission control and abatement regulations may be applied in practice uniformly across these sectors.

Industrial sectors and emission sources to be covered

The industrial sectors to be covered shall be the petrochemicals, oil refining, and chemical industries receiving, processing, storing, and/or exporting VOC (and VOC containing products). This includes also the natural gas processing/conditioning industry and the storage of natural gas and similar fuels, including methane.

The scope of the standard, and its contents, should not limit its use to the abovementioned sectors, but allow it to be used by other relevant industrial sectors.

The standard shall cover VOC emissions to the atmosphere, but not into water or soil.

The types of emissions addressed by the standard shall be primarily those related to the storage of VOC, loading and unloading processes, and other diffuse sources on the sites where such activities take place. More in particular, this should include the following:

- (i) **Storage** media covering all types of tanks including:

- fixed-roof tanks, with and without internal floating roofs;
- external floating–roof tanks;
- VOC containing liquids exposed to atmosphere (normally low vapour pressure components);
- hybrid tank covers;
- high-pressure containment of liquid VOC (including liquefied petroleum gas (LPG), liquefied natural gas (LNG));
- storage of natural gas and associated gaseous fuels.

(ii) **Loading and unloading** operations:

- loading of products used as inputs to industrial processes from other storage media (e.g. other fixed tanks that are separated from the industrial process site for prior containment and/or stabilization);
- rail, road, and ship vessel tanks for transportation;
- loading from fixed storage tanks in industrial processing areas into transport media (rail, road and ship vessel tanks for transportation and/or distribution).

(iii) **Other** diffuse VOC sources within the abovementioned sectors:

- waste water treatment plant;
- basins and lagoons;
- coking units;
- flares;
- bitumen production and storage;
- process drains and other waste systems.

Link with standard EN 15446:2008

The standard shall not cover fugitive emission sources covered already by EN 15446:2008¹ (leaks from equipment and piping). However, it shall be complementary and aim to cover all other types of fugitive and diffuse emissions (including from area sources) of VOC from the industries concerned.

Information included in standard EN 15446:2008 should be referred to and utilized in the development and validation of the new standard where appropriate.

¹ EN 15446:2008 Fugitive and diffuse emissions of common concern to industry sectors - Measurement of fugitive emission of vapours generating from equipment and piping leaks

Monitoring and estimation methods to be considered

The monitoring and estimation methods that shall be covered by this standard are:

- (i) **Optical gas imaging (OGI)** method that uses a hand held infrared camera for identification of point source leaks;
- (ii) **Differential absorption lidar (DIAL)** method that operate in the infrared and ultraviolet spectral region using laser sources;
- (iii) **Solar occultation flux (SOF)** method that monitors solar radiation in a broad spectral region;
- (iv) **Flux chamber monitoring** method that uses the build up of fugitive VOC emissions in a sealed or open chamber (generally applicable to small areas only);
- (v) **Calculation/estimation methods** using industry standards or site specific fugitive emission factors for each type of component.

The below table summarizes the range of applicability of those methods to the different fugitive and diffuse emission sources that are covered by the scope of this standard.

Types of diffuse/fugitive VOC sources	Calc/Est methods		Measurement methods				
	Emission factors and/or algorithms	Specific modelling (e.g. USA Tanks)	Point sampling and correlations (EN 15546: 2008)	Optical gas imaging camera	Solar occultation flux	Flux chamber	Differential absorption LIDAR (DIAL)
Storage tanks	Q ⁽³⁾	Q ⁽³⁾		D ⁽¹⁾	D ⁽²⁾		Q ⁽²⁾
Loading/unloading facilities	Q ⁽³⁾			D ⁽¹⁾			Q ⁽²⁾
Waste water treatment plant and other diffuse sources	Q ⁽³⁾	Q ⁽³⁾			D ⁽²⁾	Q ⁽²⁾	Q ⁽²⁾
Individual equipment (pumps, valves, flanges, etc)	Q ⁽³⁾		D/Q	D ⁽¹⁾			D/Q ⁽²⁾
Full scale industrial unit and/or whole site	Q ⁽³⁾				D/Q		Q ⁽²⁾

D = detection; Q = quantification;

- (1) The detection sensitivities of the OGI are not well established compared with the mass/concentration measurements in EN 15446:2008;
- (2) Area sources are detectable/quantifiable if the generated individual gas plumes are distinguishable from others of the site, and if the emissions occur during the measurement period;
- (3) The accuracy of the calculation is strongly influenced by the requirement to choose appropriate emission factors and algorithms, and suitable modelling, meteorological conditions, etc. that are relevant to the specific plant.

Required Components of the Validation Programme

The following elements shall be included in the validation programme:

- (1) Gathering of technical information collated during previous and current field work using these techniques, with the objective of defining the optimum field validation programme;
- (2) Selection of an industrial site where facilities exist allowing the execution of the validation programme (e.g. LDAR programme currently in place, willing to collaborate, accessible for the remote sensing methods, availability of relevant supplementary data). Two sites of different complexity shall be selected. The first to perform an initial trial of the validation method, and the second more complex site to allow lessons learnt from the first to be incorporated, demonstrated, and validated in a more complex environment;
- (3) Drawing up of specifications for
 - an optical gas imaging camera with suitable performance, and its implementation in an advanced LDAR programme for the identification of further significant sources at the selected sites;
 - industrial measurements to be made using the remote monitoring methods (infrared DIAL and SOF);
 - any supplementary measurements needed for the validation (e.g. meteorological monitoring, passive sampling, canisters for speciated VOC sampling);

The validation work should take into account the relevant use of industry and other current state-of-the-art technical procedures - including the use of infrared imaging techniques for leak identification, the roles and application of optical monitoring methods, and the possible use of other direct and indirect measurement techniques. The minimum performance requirements of these measurement methods shall be included.

4. EXECUTION OF THE MANDATE

The work plan for the execution of the abovementioned standardisation tasks is described in details in clause 3.

Time schedule and work programme for the execution of the mandate	6 months of the acceptance of the mandate.
Analysis of the applicability of selected methods to the different fugitive and diffuse emission sources	9 months of the acceptance of the mandate.
Defining the optimum field validation programme;	12 months of the acceptance of the mandate.
Two stages field validation	24 months of the acceptance of the mandate.
Drawing up of specifications for selected methods	36 months of the acceptance of the mandate.
Provide to the Commission the standards (EN, evaluation, reporting	45 months of the acceptance of the mandate.

The ESOs shall inform the Commission **within two (2) months** after the receipt of this request, if they accept this mandate

The ESOs are requested to report **every 12 months** after acceptance of the mandate on the progress of the tasks set out in this mandate, including the results of the validation tests performed and indicating any eventual difficulties encountered.

The ESOs are requested to provide to the Commission, in its three working languages, a copy of the standard(s) developed under this mandate within **45 months** of the acceptance of the mandate.

Acceptance by CEN of this mandate starts the standstill period referred to in Article 7 of Directive 98/34/EC of 22 June 1998.

5. BODIES TO BE ASSOCIATED

As appropriate, the ESOs shall invite the representative organisations of consumers' interests (ANEC), environmental protection (ECOS), workers (ETUI), the industries involved (CONCAWE, CEFIC, others) and small and medium-size enterprises (NORMAPME) to take part in the standardisation work.

ANNEX: EU REGULATIONS AND OTHER RELEVANT DOCUMENTS

This standard shall underpin and support directly the implementation of the following EU Directives:

1. **Directive 2010/75/EU** of the European Parliament and of the Council on industrial emissions, as well as the BAT reference documents and BAT conclusions developed in its context (or that of its predecessor, the IPPC Directive 2008/1/EC), in particular the following (<http://eippcb.jrc.ec.europa.eu/reference/>):

- Best Available Techniques Reference Document (BREF) for Mineral Oil and Gas Refineries, first version (February 2003) and second draft of revised version (March 2012);
- Best Available Techniques Reference Document (BREF) on Emissions from Storage (July 2006), in particular the chapters related to storage, transfer and handling of liquid and gaseous products
- Best Available Techniques Reference Document (BREF) for Large Volume Organic Chemical Industry (February 2003), currently under revision

2. **Directive 2001/81/EC** on national emission ceilings for certain atmospheric pollutants;

3. **Directive 94/63/EC** on the control of volatile organic compound (VOC) emissions resulting from the storage of petrol and its distribution from terminals to service stations;

Other relevant documents to be consulted during developing the standard(s), include:

1. CONCAWE Report 1/09: Air pollutant emission estimation methods for E – PRTR reporting by refineries, January 2009 Edition;
2. CONCAWE Report 6/08: Optical methods for the remote measurement of diffuse VOCs – Their Role in the Quantification of Annual Refinery Emissions CONCAWE AQ/STF – 72, 2008;
3. Refinery Demonstration of Optical Technologies for the Measurement of fugitive emissions and for Leak Detection A. K. Chambers et al., Alberta Research Council, 2006;
4. US EPA Other Test Method OTM10 – Optical Remote Sensing for Emission Characterization from Non-point Sources, June 2006;
5. Equivalent leak definitions for SMART LDAR when using optical imaging technology, D. Epperson et al., Jour. Air & Waste Management Association, September 2007.