SLOVENSKI STANDARD
oSIST prEN 17628:2020

01-december-2020

Ubežne in razpršene emisije skupnega pomena za industrijske sektorje - Standardna metoda za določevanje razpršenih emisij hlapnih organskih spojin v ozračje

Fugitive and diffuse emissions of common concern to industry sectors - Standard method to determine diffuse emissions of volatile organic compounds into the atmosphere

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Ta slovenski standard je istoveten z: **prEN 17628**

ICS:

13.040.40 Emisije nepremičnih virov Stationary source emissions

oSIST prEN 17628:2020 **en,fr,de**

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oSIST prEN 17628:2020
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oSIST prEN 17628:2020

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 17628

December 2020

ICS 13.040.40

English Version

Fugitive and diffuse emissions of common concern to industry sectors - Standard method to determine diffuse emissions of volatile organic compounds into the atmosphere

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 264.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Ref. No. prEN 17628:2020 E

oSIST prEN 17628:2020

Contents

Page

iTeh STANDARD PREVIEW
(standards.iteh.ai)
oSIST prEN 17628:2020
https://standards.iteh.ai/catalog/standards/sist/d0c1a578-3cdb-4e30-a684-
oSIST prEN 17628:2020

oSIST prEN 17628:2020

iTeh STANDARD PREVIEW
(standards.iteh.ai)
oSIST prEN 17628:2020
https://standards.iteh.ai/catalog/standards/sist/d0e1a578-3edb-4e30-a684-bc1d445e4396/osist-pren-17628-2020

oSIST prEN 17628:2020

iTeh STANDARD PREVIEW
(standards.iteh.ai)
oSIST prEN 17628:2020
https://standards.iteh.ai/catalog/standards/sist/d0c1a578-3cdb-4e30-a684-bc1d445e4396/osist-pren-17628-2020

oSIST prEN 17628:2020

iTeh STANDARD PREVIEW
(standards.iteh.ai)
oSIST prEN 17628:2020
https://standards.iteh.ai/catalog/standards/sist/d0c1a578-3cdb-4e30-a684-bc1d445e4396/osist-pren-17628-2020

oSIST prEN 17628:2020

iTeh STANDARD PREVIEW
(standards.iteh.ai)
oSIST prEN 17628:2020
https://standards.iteh.ai/catalog/standards/sist/d0c1a578-3cdb-4e30-a684-[illegible]/osist-pren-17628-2020

oSIST prEN 17628:2020

European foreword

This document (prEN 17628:2020) has been prepared by Technical Committee CEN/TC 264 “Air quality”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
oSIST prEN 17628:2020
https://standards.iteh.ai/catalog/standards/sist/d0c1a578-3cdb-4e30-a684-bc1d445e4396/osist-pren-17628-2020

oSIST prEN 17628:2020

Introduction

0.1 Background

This document has been developed to provide a framework for the selection and use of monitoring methods to determine (detect, identify and/or quantify) the emission to the air of volatile organic compounds (VOC) from diffuse sources, in particular due to the storage, transfer and handling (loading/unloading) of such compounds, within certain industrial sectors. It has primarily been developed to meet the needs of the European Best Available Technique Reference (BREF) document for the refining of mineral oil and gas [1] including the Commission implementing decision [2] establishing best available techniques (BAT) conclusions, under Directive 2010/75/EU [3] on industrial emissions, for the refining of mineral oil and gas.

Emissions of VOCs from anthropogenic, biogenic and other natural sources contribute to the formation of ozone and other pollutants in the atmosphere which are detrimental to human health and damaging to the environment. Better determination of the anthropogenic contribution can help reduce these impacts. A wide range of human activities can give rise to emissions (e.g. industrial processes, transport, the storage and handling of fuels and chemicals, end use of VOC containing products, etc.). Emission sources can be complex and diffuse sources are difficult to determine accurately. Their determination has hitherto required the use of specific measurement and estimation methods not subject to standardization. By setting out appropriate standardization criteria and demonstrating their use with certain techniques, the determination of diffuse VOC should be improved, assisting the management of emissions and consequential benefits.

0.2 European context

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National reduction targets for VOC emissions to air in European countries are regulated through the Gothenburg Protocol [4] of the UN-ECE Convention on Long-range Trans-boundary Air Pollution (CLRTAP) and, additionally, for the EU Member States and the EU as a whole by the National Emission Ceilings Directive (2016/2284/EU [5]). Annual reporting of emissions is required under both instruments.

oSIST prEN 17628:2020
https://standards.iteh.ai/catalog/standards/sist/d0cfa578-9cdb-4e30-a684-bc1d445e4396/osist-pren-17628-2020

National emissions are the sum of sectoral emissions. Within the EU sectoral emissions are regulated to enable the national commitment to be met. For the largest industrial sectors the principle instrument is the Industrial Emissions Directive (Directive 2010/75/EU [3]). The Industrial Emissions Directive (IED) sets minimum emission standards for certain pollutants in key sectors but, more importantly, sets out formal guidance to permitting authorities on the emissions, to both air and water and expressed as concentrations or loads, that might be achieved through the application of Best Available Technology (BAT). Conclusions on BAT (BATC) are published in the Journal of the European Union and have legal status. The BATC are derived through a formal process (the Sevilla Process) of data collection and appraisal recorded in Best Available Techniques Reference documents (BREFs). BREFs provide context and guidance for the interpretation of the BATC. The IED sets out a requirement to review, and if necessary, revise, each sectoral BREF on an 8-year cycle.

This document supports BATCs that require diffuse VOC emissions to be assessed and reported. These are, at the time of writing, set out in:

— Mineral Oil and Gas Refineries [2] (BAT 6);

— Common Waste Water and Waste Gas in the Chemical Sector [6] (BAT 5);

— Common Waste Gas Management and Treatment Systems in the Chemical Sector (BAT 22) [7].

General information on Monitoring for Diffuse Emissions can be found in the JRC Reference Report on Monitoring of Emissions to Air and Water from IED Installations (EUR 29261 EN) [8].

oSIST prEN 17628:2020

1 Scope

This document specifies the framework for determining emissions to the atmosphere of Volatile Organic Compounds (VOCs). It defines a system of methods to detect and/or identify and/or quantify VOC emissions from industrial sources. These methods include Optical Gas Imaging (OGI), Differential Absorption Lidar (DIAL), Solar Occultation Flux (SOF), Tracer Correlation (TC), and Reverse Dispersion Modelling (RDM). It specifies the methodologies for carrying out all the above, and also defines the performance requirements and capabilities of the direct monitoring methods, the requirements for the results and their measurement uncertainties.

This document specifically addresses, but is not restricted to, the petrochemicals, oil refining, and chemical industries receiving, processing, storing, and/or exporting of VOCs, and includes the emissions of VOCs from the natural gas processing/conditioning industry and the storage of natural gas and similar fuels.

This document addresses diffuse VOC emissions to atmosphere but excludes the emissions of VOCs into water and into solid materials such as soils. It is complementary to EN 15446 [9], which covers detection, localization of sources (individual leaks from equipment and piping), and quantification of fugitive VOC emissions within the scope of a Leak Detection and Repair Programme (LDAR).

This document has been validated for non-methane VOCs, but the methodologies are in principle applicable to methane and other gases.

This document defines methods to determine (detect, identify and/or quantify) VOC emissions during the periods of monitoring. It does not address the extrapolation of emissions to time periods beyond the monitoring period.

iTeh STANDARD PREVIEW
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2 Normative references

oSIST prEN 17628:2020
https://standards.iteh.ai/catalog/standards/sist/d0c1a578-3cdb-4e30-a684-bc1d445e4396/osist-pren-17628-2020

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 15259, *Air quality - Measurement of stationary source emissions - Requirements for measurement sections and sites and for the measurement objective, plan and report*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
detection
recognition of the presence of an emission source in a certain area

3.2
localisation
determination with a certain degree of precision of the position of an emission

3.3
quantification
determination of an emission rate

3.4
site
area within a defined perimeter where emissions might take place

oSIST prEN 17628:2020

3.5
section
delimited area within a site usually having a specific function

3.6
main equipment
delimited piece of equipment

3.7
component
assembly or mechanical part of an item of main equipment

3.8
volatile organic compound
VOC
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

[SOURCE: Directive 2010/75/EC [3], modified]

Note to entry: Care is necessary in the use of the term VOC, as there are many different definitions in common use. In some cases, VOC excludes methane or methane and ethane. It is recommended to clearly state which range of compounds are reported.

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3.9
organic compound
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

oSIST prEN 17628:2020
https://standards.iteh.ai/catalog/standards/sist/d0c1a578-3cdb-4e30-a684-bc1d445e4396/osist-pren-17628-2020

[SOURCE: Directive 2010/75/EC [3]]

3.10
emission
discharge of substances into the atmosphere

Note 1 to entry: This term comprises four types of emission sources:

— Accounted channelled emissions (from monitored stacks)

— Unaccounted channelled emissions (from, e.g. vents, flares)

— Fugitive emissions (leaks from, e.g. valves, seals)

— Area emissions (from, e.g. water treatment basins, coke storage)

3.11
fugitive emission
emission to the atmosphere caused by loss of tightness of an item which is designed to be tight

[SOURCE: EN 15446:2008 [9]]

oSIST prEN 17628:2020

3.12
diffuse emission
emission to the atmosphere from an identified site or facility, not specifically directed to identified stack emission points

Note to entry: This term comprises the sum of various unaccounted channelled emissions, fugitive emissions and area emissions.

3.13
expanded uncertainty
quantity defining an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand

Note 1 to entry: The fraction may be viewed as the coverage probability or level of confidence of the interval.

Note 2 to entry: To associate a specific level of confidence with the interval defined by the expanded uncertainty requires explicit or implicit assumptions regarding the probability distribution characterized by the measurement result and its combined standard uncertainty. The level of confidence that may be attributed to this interval can be known only to the extent to which such assumptions may be justified.

Note 3 to entry: Expanded uncertainty is termed overall uncertainty in paragraph 5 of Recommendation INC-1 (1980).

[SOURCE: ISO/IEC Guide 98-3:2008 [10]]

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3.14
detection limit
minimum concentration of a substance which produces an observable response, which is two times the standard deviation at zero

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[SOURCE: EN 12619:2013 [11]]

4 Symbols and abbreviations

API	American Petroleum Institute
DIAL	Differential Absorption Lidar
DQO	Data Quality Objective
LDAR	Leak Detection and Repair
LIDAR	Light Detection and Ranging
OGI	Optical Gas Imaging
RDM	Reverse Dispersion Modelling
SOF	Solar Occultation Flux
TC	Tracer Correlation
VOC	Volatile Organic Compound

5 Principle

This document provides a framework for a number of complementary methods (DIAL, SOF, OGI, TC, and RDM) used to determine diffuse VOC emissions. It provides performance requirements and quality assurance procedures to ensure the correct application of each method. Common issues are identified

oSIST prEN 17628:2020

and addressed within the main body of this document, method specific procedures and requirements are given in the relevant Annexes.

Methods are described as complementary because each has a potential role to play within an efficient VOC emission monitoring programme. For example, whereas periodic surveys of equipment can be undertaken using a leak detection and repair programme (LDAR) as described in EN 15446 [9], surveys of equipment and other potential emission sources (tanks, loading operations etc.) can be undertaken using OGI as described in this document. Periodic surveys of the whole site, or targeted areas therein, can be undertaken using DIAL and/or SOF. Where specific sources are identified TC and RDM techniques can be used for quantification.

6 Measurement objectives

6.1 General

A VOC monitoring program focussed on diffuse emissions has three main objectives: the detection of emission sources, their localization, and the quantification of emissions. Diffuse emissions can arise from leaks in which case detection and localization of the specific source is needed. Diffuse emissions also arise from normal operations in which case quantification can inform on the magnitude of emissions and indicate whether detection and localization of contributing sources is needed.

There are a number of different monitoring approaches that can be taken to meet these objectives. These range from a bottom-up investigation of potential emission source points, to a top-down investigation using remote sensing to first survey all or part of a site. Unexpected emissions can then be more closely investigated.

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A baseline for expected emission sources is set from a site emission inventory and results from previous monitoring studies. Many diffuse sources are time-varying, and this document requires operational events that might contribute to emissions during the time of a survey to be documented. Determining the temporal variation of specific emission sources may be a measurement objective.

oSIST prEN 17628:2020
https://standards.iteh.ai/catalog/standards/sist/d0c7a578-9eda-4e90-a684-be1d445e4396/osist-pren-17628-2020

The broad nature of diffuse emissions and the many options for their determination makes it essential to set clear and specific measurement objectives for the monitoring campaign. This particularly affects the choice of methods to be used and expectations for data quality. It should be noted that all the methods covered by this document are dependent on external circumstances (meteorology, site operational constraints etc.) specific to the monitoring period and measurement objectives should, in their detail, be tolerant of such.

When measurement objectives are specified the following elements shall be considered:

— The purpose of the monitoring campaign shall be clearly stated. This defines the scope and key deliverables of the campaign.

— The site or section(s) to be monitored shall be defined. For a section this will require information on the main equipment therein and components thereof, to be gathered. This information to be complemented by information on process streams and their thermodynamic state according to the measurement to be made.

— The type of monitoring for each section shall be defined. Examples might include detection, detection and localization of individual sources, detection and quantification of emissions.

— The spatial resolution of the monitoring shall be defined. This will reflect the type of monitoring to be conducted. Consideration shall be given to the techniques involved. For example, objectives shall be consistent with the spatial resolution of the techniques.

oSIST prEN 17628:2020

— For localization objectives should address the spatial resolution required. For example, to main equipment or, if repair is mandated, to the scale of the emission source.

— For quantification, objectives should explicitly address how emissions from different sources are separated. At a site-scale external (off-site) sources are to be accounted. At section scale, emissions from neighbouring sections need to be accounted, and so forth.

— For quantification measurement objectives for meteorological measurement should ensure necessary and appropriate data are gathered.

— The time duration of the monitoring shall be defined. Considerations will be different for monitoring chronic (steady) sources, sources that have emissions that vary in time e.g. as a consequence of operations, irregular emissions.

— The species to be determined shall be defined.

6.2 Quantification of site emissions

The methods DIAL and SOF can determine emissions from an entire site within constraints imposed by location and appropriateness of meteorological conditions during the measurement period. The proximity of VOC sources outside of the site boundary is important as they shall be excluded from emission rate calculations. Both techniques rely on determining the difference between upwind and downwind VOC emission rates. Both techniques have an operating window with respect to wind speed and stability of wind direction. SOF has an operating window depending on solar insolation. These constraints are documented in the measurement procedures.

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Determination of site emissions requires a sufficient number of measurements to be made. The method descriptions provide sufficiency criteria. Measurements can be carried out under different wind conditions to check for systematic errors under the assumption of constant emissions. VOC emissions are unlikely to be constant over the course of a campaign making it important to document site operations and establish a time line between measurement and potential emission events upwind of each measurement plane prior to and during the measurement period. If there are non-diffuse VOC emissions (e.g. channelled emissions) inside the source area during the measurement period these should be accounted for.

oSIST prEN 17628:2020
https://standards.iteh.ai/catalog/standards/sist/d0c1a578-3cdb-4e30-a684-bc1d445e4396/osist-pren-17628-2020

Where constraints prevent direct determination of the whole site emission it may be obtained by combining a number of separate section emissions. The requirements for the whole site emission determination apply to each section emission determination. The section emission values, timeline and the methodology to combine them should be documented.

6.3 Quantification of section emissions

The emission from sections can be determined using methods DIAL, SOF, and – with limited applicability – RDM and TC within constraints imposed by location and appropriateness of meteorological conditions during the measurement period. The proximity of VOC sources outside of the section boundary is important as they shall be excluded from emission rate calculations.

Measurements can be carried out under different wind conditions to check for systematic errors under the assumption of constant emissions. Subtraction of contributions from outside the section will need to be addressed. VOC emissions are not likely to be constant over the course of a campaign making it important to document section operations (both process and maintenance) and meteorological conditions and to establish a timeline of potential upwind emission events prior to and during the measurement period. Method procedures should separate temporal variation in emissions from uncertainty in emission determination, including the correction for upstream sources. If there are non-diffuse VOC emissions (e.g. channelled emissions) inside the source area during the measurement period these should be accounted for.