Irish Standard
I.S. EN ISO 11771:2010

Air quality - Determination of time-averaged mass emissions and emission factors - General approach (ISO 11771:2010)

I.S. EN ISO 11771:2010

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EUROPEAN STANDARD

NORME EUROPÉENNE

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December 2010

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English Version

Air quality - Determination of time-averaged mass emissions and emission factors - General approach (ISO 11771:2010)

Qualité de l'air - Détermination de la moyenne temporelle des émissions massiques et des facteurs d'émission - Approche générale (ISO 11771:2010)

Luftbeschaffenheit - Ermittlung von zeitlich gemittelten Massenemissionen und Emissionsfaktoren - Allgemeine Vorgehensweise (ISO 11771:2010)

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN ISO 11771:2010) has been prepared by Technical Committee CEN/TC 264 “Air quality”, the secretariat of which is held by DIN, in collaboration with Technical Committee ISO/TC 146 “Air quality”.

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INTERNATIONAL STANDARD

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Air quality — Determination of time-averaged mass emissions and emission factors — General approach

Qualité de l'air — Détermination de la moyenne temporelle des émissions massiques et des facteurs d'émission — Approche générale

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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ISO 11771 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 264, *Air quality*, in collaboration with Technical Committee ISO/TC 146, *Air quality*, Subcommittee SC 4, *General aspects*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Introduction

This Intenational Standard describes the measurement procedures necessary to determine the mass emission of substances from stationary sources. Empirically generated data are necessary to determine the uncertainty that can be associated with a stated result and to enable the verification of emission measurement reports.

This Intenational Standard also describes the measurement procedures necessary to determine emission factors. An emission factor is a value that relates the quantity of a pollutant released with an activity associated with the release of that pollutant. Emission factors are useful when the operational conditions and time period for which they are representative is known.

Emission factors are used to calculate and report mass emissions for both emission inventory and non-inventory uses. Inventory uses can include:

— emission trading;

— compiling polluting release and transfer registers;

— air quality modelling;

— air quality management;

— compliance with national emission limits.

Non-inventory uses can include:

— developing site-specific emission estimates;

— developing control strategies;

— risk assessments;

— deciding appropriate permit limits.

The most commonly used methodology for compiling an emission inventory is to combine information on the extent to which an activity takes place (quantified by activity data a) with representative values of the emissions or removals per unit activity, called emission factor F. The basic equation providing the emission as a mass emission rate $\dot{m}$ is given by

$$\dot{m} = aF$$

The basic equation can be modified in some circumstances to include, for instance, emission reduction efficiency (abatement) factors.

NOTE 1 Countries compiling inventories for reporting emissions under international agreements use methodologies agreed upon by convention {e.g. UN FCCC, UN ECE Long-range Transboundary Air Pollution (Reference [31]), or the UN ECE Aarhus Convention}. A common feature of all these conventions is a requirement to use good practice methodologies when estimating and reporting emissions. This is particularly important when providing emission estimates for base year emission inventories used in policy instruments. Good practice is usually taken to mean the use of procedures that ensure inventories are accurate (i.e. without bias) in the sense that they are systematically neither over- nor underestimates so far as can be judged, and that uncertainties are reduced so far as possible. Good practice guidance does not usually specify how to establish emission factors or what information should be reported and be available to allow broad application of emission factors. It is the goal of this International Standard to close this gap, to increase the quality of emission inventories and to improve efficiency.

Emission factors published in most compilations typically are:

— arithmetic averages of available source emission measurement data;

— based on a limited number of emission measurements;

— representative of a restricted period of process operating time;

— representative of a limited range of process operating conditions;

— representative of a limited sample of process units commonly used.

Emission factors are numerical estimates with uncertainties that can include systematic and random components, e.g. measurement uncertainty, fluctuations in pollutant emission control efficiency, and variability in process operation. The numerical uncertainty associated with a particular emission factor, for a single source, can be estimated provided that there is sufficient, high quality, source test data to estimate statistically the underlying variability of the more important influencing factors. Uncertainty also arises from the use of an emission factor applicable to one activity, process, technology or installation being used to represent a situation for which it is unsuitable. In many cases, it is not possible to quantify the uncertainty introduced through inappropriate use of emission factors, and this situation is discouraged.

Emission factors should be used with caution. Alternative means exist for estimating emissions that can be more appropriate under some circumstances.

A material balance can provide an adequate quantification of emissions in situations where a high percentage of material is lost to the atmosphere (e.g. carbon and sulfur in fuel, solvent loss in an uncontrolled coating process). Material or mass balance determinations can also account for fugitive emissions not easily measured otherwise. In contrast, material balances may be inappropriate where material is consumed or chemically combined in the process, or where losses to the atmosphere are a small portion of the total process throughput.

Data from frequent and representative source-specific emissions measurements or continuous emission monitoring systems can provide measures of actual pollutant emissions from a source.

Site-specific measurement data from a limited number of emissions measurements, while improving the certainty of the emission data, represent only the conditions existing at the time of the testing or monitoring. To improve the estimate of longer-term (e.g. daily, monthly, yearly) emissions, conditions under which tests occur should be representative of the source's expected range of operations.

NOTE 2 Even in the absence of representative source-specific data, emission information from process control technique and abatement system vendors, particularly emission performance guarantees or emission measurement data from similar equipment can still be a better source of information than source-category emission factors.

This International Standard requires the use of supporting standards not all of which are yet available.

Air quality — Determination of time-averaged mass emissions and emission factors — General approach

1 Scope

This International Standard specifies a generic method for the determination and the reporting of time-averaged mass emissions from a specific installation or of a family of installations (or common source type), using data collected by measurements, and by establishing:

— mass emission rates by the simultaneous measurement of concentration and gas flow, using standardized manual or automatic methods, and also the estimation of the uncertainty of the measurements;

— time-averaged mass emission rates using time series of mass emission rate values, their uncertainty characteristics, and also the determination of the expanded uncertainty of the average;

— time-averaged emission factors for a specific installation or of a family of installations and their associated uncertainty characteristics;

— a quality management system to assist the process of inventory quality assurance and verification.

This International Standard is applicable to the determination of emission factors for stationary sources including emissions from industrial processes where calculation from fuel and raw material is not practical, for greenhouse gases, and air pollutants including fine particulate material. This International Standard does not address compliance monitoring in the context of emission control regulations.

This International Standard requires the use of measurement-based methods and calculation-based methods that use measurement data. It covers the planning and execution of the measurement programme to collect data, selection of sampling methods, calculation of results, estimation of uncertainty, determination of emission factors, and the reporting of information in a form that enables users to apply them. This International Standard specifies how to:

— generate time-averaged mass emission rate data of a known quality, for a defined period of time, and a documented set of operational conditions;

— generate complete data sets representative of a known time period (i.e. a calendar year) by filling gaps in mass emission rate data series and combining data sets numerically;

NOTE 1 Time series data can be available for only a limited elapsed period (i.e. weeks, months, or years) and can be available only for a discrete process whereas inventories can be necessary which average over a different period (i.e. for a calendar year).

— calculate emission factors for a known time period;

— calculate time-averaged emission factors of a known quality for a known source type.

The measurement of emissions from vehicular, area or fugitive sources is not specifically covered. However, this International Standard can be used for quantification of emission factors for those sources provided that measurements of emissions are available.

NOTE 2 Emission fluxes from fugitive and area sources can be directly measured using optical open-path techniques. The results from these measurements can be treated in an analogous way to the measurements described in this International Standard to determine time-averaged emissions and emission factors.

This International Standard does not explicitly include measurement procedures that are fully described in the referenced standards. Neither does it provide advice on the generation of activity statistics.

This International Standard is compatible with ISO 14064-1[5] and ISO 14064-3[6].

2 Terms and definitions

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

2.1
emission factor
ratio of the rate at which an air pollutant is emitted as a result of some activity, to the rate of that activity

NOTE 1 Adapted from ISO 4225:1994[2], 3.31.

EXAMPLE The mass, in kilograms, of particulate emitted per tonne of coal burned, the mass, in kilograms, of NO_x per tonne of clinker produced in a country per year, or the mass, in tonnes, of CO_2 emitted per megajoule of energy produced.

NOTE 2 Since data are usually derived for a limited range of operating conditions or periods, the conditions or periods over which an emission factor can be considered typical or applicable are needed (see 5.2.2).

NOTE 3 Emissions refer to the set of individual substances that are emitted.

NOTE 4 An emission factor differs from a mass emission rate, the latter has specific dimensions of mass divided by time.

2.2
good practice
set of procedures intended to ensure that reported emissions are accurate (i.e. without bias) in the sense that they are systematically neither over- nor underestimates as far as can be judged, and that uncertainties are reduced as far as possible

2.3
measurand
particular quantity subject to measurement

[ISO 9169:2006[3], 2.1.11]

2.4
measurement system
complete set of measurement instrumentation and associated equipment used for the determination of a specified measurand

2.5
measurement plan
document describing the data collection methodology to be used for a particular installation, the type and quantity of data to be collected, the data processing, the quality system to be adopted, and the processes to be used to estimate measurement uncertainty

NOTE The measurement plan describes any provisions specific either to periodic determinations of mass emissions or emission factors by a test laboratory or to continuous mass flow measurements made by the operator of an installation.

2.6
test
technical operation that consists of the determination of one or more characteristics of a given product, process or service in accordance with a procedure

NOTE 1 For emission measurements, a test consists of series of measurements of one measurand or of combined measurements of several measurands.

NOTE 2 A valid test is often specified as a number of measurements (usually not less than three) that is indicative of the process emission under observation.