SLOVENSKI STANDARD

oSIST prEN ISO 19694-5:2014

01-november-2014

Emisije nepremičnih virov - Določevanje emisij toplogrednih plinov (TGP) v energetsko intenzivnih industrijah - 5. del: Proizvodnja apna (ISO/DIS 19694-5:2014)

Stationary source emissions - Determination of greenhouse gas (GHG) emissions in energy-intensive industries - Part 5: Lime industry (ISO/DIS 19694-5:2014)

Émissions de sources fixes - Détermination des émissions des gaz à effet de serre dans les industries à forte intensité énergétique - Partie 5: Industrie de la chaux (ISO/DIS 19694-5:2014)

Ta slovenski standard je istoveten z: **prEN ISO 19694-5**

ICS:

13.040.40	Emisije nepremičnih virov	Stationary source emissions

oSIST prEN ISO 19694-5:2014 **en**

DRAFT INTERNATIONAL STANDARD

ISO/DIS 19694-5

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Stationary source emissions — Determination of greenhouse gas (GHG) emissions in energy-intensive industries —

Part 5: Lime industry

Émissions de sources fixes — Détermination des émissions des gaz à effet de serre dans les industries à forte intensité énergétique —

Partie 5: Industrie de la chaux

ICS: 13.040.40

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Reference number
ISO/DIS 19694-5:2014(E)

General information regarding the preparation of EN ISO 19694 Part 1 to 6

By end of 2010 the European Commission/EFTA gave Mandate M/478 to CEN entrusting CEN to produce and adopt Standards, in particular containing harmonized methods for:

a. Measuring, testing and quantifying greenhouse gas (GHG) emissions from sector-specific sources

b. Assessing the level of GHG emissions performance of production processes over time, at production sites;

c. Establishing and providing reliable, accurate and quality information for reporting and verification purposes.

Based on a gap analysis it was agreed to describe the assessment methodologies of the five energy-intensive industry sectors steel-, cement -, aluminum-, lime- and ferroalloy industry as well as general aspects in the six standards. As sector-specific knowhow was essential, the concerned industry sectors (companies and associations) have been engaged extensively in the development of the methodologies as well as the draft standards.
The methods of determination of green house gases (GHG) in these five energy intensive industries were subject to comprehensive verification exercises (field tests) which were financially supported by EC/EFTA and which reflect especially the uncertainties obtained.

The scope of the six standards is limited to the above described mandated frame and cannot be arbitrarily enlarged.

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Foreword

This document (TC 264 WI 00264146) 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, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex D, which is an integral part of this document.

1 Scope

This standard provides a harmonised methodology for calculating GHG emissions from the lime industry. It includes the manufacture of lime, and any downstream products manufactured at the plant, such as ground or hydrated lime. This standard allows for reporting of GHG emissions for various purposes and on different basis, such as plant basis, company basis (by country or by region) or international group basis.

Since lime is defined as the generic name for quicklime, dolime and sintered dolime, the plants manufacturing at least one of these products shall be covered by this standard.

This standard addresses all of the following direct and indirect sources of GHG included as defined in ISO 14064-1:

- Scope 1 – Direct GHG emissions from sources that are owned or controlled by the company, such as emissions resulting from the following sources:
  - Process: Calcination of carbonates and combustion of organic carbon contained in the kiln stone
  - Combustion of kiln fuels (fossil kiln fuels, alternative fossil fuels, mixed fuels with biogenic carbon content, biomass fuels and bio fuels) related to lime production and/or drying of raw materials
  - Combustion of non-kiln fuels (fossil kiln fuels, mixed fuels with biogenic carbon content, biomass fuels and bio fuels) related to equipment and on-site vehicles, room heating/cooling
  - Combustion of fuels for on-site power generation
- Scope 2 – Indirect GHG emissions from the generation of purchased electricity consumed in the company’s owned or controlled equipment
- Scope 3 – Indirect GHG emissions from imported kiln stone

This standard shall be used in conjunction with standard “prEN xxxxx *Stationary source emissions — Determination of Greenhouse Gas (GHG) emissions in energy intensive industries — Part 1: General aspects”* which contains generic, overall requirements, definitions and rules applicable to the determination of GHG emissions for all energy-intensive sectors, provides common methodological issues and defines the details for applying the rules. The application of this standard to the sector-specific standards ensures accuracy, precision and reproducibility of the results and is for this reason a normative reference standard.

Together these standards provide a harmonised method for:

1) measuring, testing and quantifying methods for GHG emissions,

2) assessing the level of GHG emissions performance of production processes over time, at production sites,

3) establishment and provision of reliable, accurate and quality information for reporting and verification purposes.

GHG emissions offset mechanisms, including but not limited to voluntary offset schemes or nationally or internationally recognized offset mechanisms, shall not be used at any point in the GHG assessment according to this standard.

2 Normative references

The following referenced documents are indispensable for the application 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.

prEN xxxxx, Stationary source emissions — Determination of Greenhouse Gas (GHG) emissions in energy intensive industries — Part 1: General aspects

EN 228, Automotive fuels — Unleaded petrol — Requirements and test methods

EN 459-2. Building lime — Test methods

EN 932-1, Tests for general properties of aggregates — Methods for sampling

EN ISO 3675, Crude petroleum and liquid petroleum products — Laboratory determination of density — Hydrometer method

ISO 5069-1, Brown coals and lignites — Principles of sampling — Part 1: Sampling for determination of moisture content and for general analysis

EN ISO 12185, Crude petroleum and liquid petroleum products — Laboratory determination of density — Oscillating U-tube method

EN 12485, Chemicals used for treatment of water intended for human consumption — Calcium carbonate, high-calcium lime, half-burnt dolomite, magnesium oxide and calcium magnesium carbonate — Test methods

EN 13639, Determination of Total Organic Carbon in limestone

ISO 13909-1 to 8, Hard coal and coke — Mechanical sampling

EN ISO 14021, Environmental labels and declarations — Self declared environmental claims (Type II environmental labelling)

ISO 14064-1, Greenhouse gases — Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals

ISO 14064-3, Greenhouse gases — Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions

EN 14181, Stationary source emissions — Quality assurance of automated measuring systems

EN 15440, Solid recovered fuels — Methods for the determination of biomass content

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

EN 15442, Solid recovered fuels — Methods for sampling

EN ISO 17021, Conformity assessment: Requirements for bodies providing audit and certification of management systems

ISO 18283, Hard coal and coke — Manual sampling

EN 45011, General requirements for bodies operating product certifications systems

3 Terms and definitions

For the purposes of this document, the terms and definitions in “prEN xxxxx Stationary source emissions — Determination of Greenhouse Gas (GHG) emissions in energy intensive industries — Part 1: General aspects” apply.

In addition, the following terms and definitions apply:

3.1
activity data
information on material flow, consumption of fuel, input material or production output

Note to entry: Expressed as energy [GJ] or as mass or volume [t or m_n^3] in the case of fuels and mass or volume in the case of raw materials or products [t or m_n^3].

3.2
aggregates
all stones extracted from a quarry except those used as kiln stone

3.3
dolime
product resulting from the calcination of kiln stone consisting of calcium carbonate and magnesium carbonate

3.4
downstream lime product
downstream products including Run-Of-Kiln lime (ROK), Lime Kiln Dust (LKD) and products made from them at the plant including ground lime

3.5
free CaO and MgO
calcium oxide or magnesium oxide that has been produced in the kiln during the decarbonation of calcium carbonate or magnesium carbonate

Note to entry: The terminology free CaO and MgO as used in this standard may differ from the terminology applied in other standards.

3.6
kiln battery
group of kilns of the same design

EXAMPLE Parallel Flow Regenerative Kilns, Annular Shaft Kilns, Mixed Feed Shaft Kilns, Preheater Rotary Kilns or Long Rotary Kilns

3.7
kiln stone
limestone that is fed into the kiln

3.8
lime (LI)
generic name for quicklime, dolime or sintered dolime

3.9
lime kiln dust (LKD)
partly calcined kiln stone material which is extracted by the kiln particulate abatement system

3.10
limestone (LS)
sedimentary rock consisting of calcium carbonate ($CaCO_3$), magnesium carbonate ($MgCO_3$), mineral and other minor impurities, including in some cases a small fraction of organic carbon

3.12
quicklime
product resulting from the calcination of limestone consisting primarily of calcium carbonate

3.13
residual CO_2
CO_2 that remains in the product leaving the kiln which is bound with CaO in the form of $CaCO_3$ also possibly with MgO in form of $MgCO_3$

3.14
run-of-kiln lime (ROK)
direct output from the kiln

3.15
sintered dolime
dolime heated to temperatures below its melting temperature, so as to increase its density

4 Symbols and abbreviations

$CaCO_{3\ LS}$:	weight fraction of calcium carbonate in the dry limestone fed into the kiln,
$MgCO_{3\ LS}$:	weight fraction of magnesium carbonate in the dry limestone fed into the kiln,
$CaO_{\ LI\text{-}ROK}$:	weight fraction of free calcium oxide in the dry ROK lime produced by the kiln,
$MgO_{\ LI\text{-}ROK}$:	weight fraction of free magnesium oxide in the dry ROK lime produced by the kiln,
$CaCO_{3\ LI\text{-}ROK}$:	weight fraction of calcium carbonate in the dry ROK lime produced by the kiln,
$MgCO_{3\ LI\text{-}ROK}$:	weight fraction of magnesium carbonate in the dry ROK lime produced by the kiln. In practice, this mass fraction can be considered as close to 0 as the magnesium carbonate is fully converted to magnesium oxide due to the temperatures prevailing in the kiln.
$CaO_{\ LKD}$:	weight fraction of free calcium oxide in the dry LKD,
$MgO_{\ LKD}$:	weight fraction of free magnesium oxide in the dry LKD,
$CaCO_{3\ LKD}$:	weight fraction of calcium carbonate in the dry LKD,
$MgCO_{3\ LKD}$:	weight fraction of magnesium carbonate in the dry LKD,
$m_{\ LS:}$	dry mass of limestone fed into the kiln (expressed in tonnes),
$m_{\ LI\text{-}ROK}$:	dry mass of ROK lime (expressed in tonnes),
$m_{\ LKD}$:	dry mass of LKD generated by the process (expressed in tonnes),
$m_{\ CO2\text{-}stack}$:	mass of CO_2 escaping through the stack (expressed in tonnes),
$M_{\ CaCO3}$:	molar mass of calcium carbonate (100.087 g/mol),
$M_{\ MgCO3}$:	molar mass of magnesium carbonate (84.314 g/mol),

M_{CaO}: molar mass of calcium oxide (56.077 g/mol),

M_{MgO}: molar mass of magnesium oxide (40.304 g/mol),

M_{CO2}: molar mass of carbon dioxide (44.010 g/mol),

η_{LI}: mass flow of LKD generated in the dedusting system(s) of the kiln divided by the mass flow of ROK lime produced by the kiln

η_{LS}: mass flow of LKD generated in the dedusting system(s) of the kiln divided by the dry mass flow of limestone fed into the kiln

EF_{LI} emission factor of the ROK lime, here the CO_2 emissions resulting from the calcination of the limestone factor per mass of ROK lime.

EF_{LS} emission factor of the limestone, here the CO_2 emissions resulting from the calcination of the limestone factor per mass of limestone.

TOC_{LS} Total organic carbon content of the limestone

m_{Fy} material flow of a fuel (y), I.e. the fuel consumption expressed as mass [t] for solid and liquid fuels or as volume [m^3_N] for gaseous fuels

CV_{Fy} calorific value of the fuel (y) usually expressed as GJ/t or GJ/m^3_N. It is important to note that the applied calorific value always has to match the status of the fuel, especially with respect to the correct moisture content during its weighing (e.g. raw coal or dried coal)

EF_{Fy} emission factor of the fuel (y) expressed as $t_{CO2\ eq}$/GJ (combustion emissions)

Ox_{Fy} oxidation factor of the fuel (y)

5 Introduction

Overview of lime manufacturing process

Lime manufacture includes three main process steps (Figure):

a) Kiln stone preparation including quarrying, crushing, washing, screening and transporting to the lime kiln;

b) Kiln operation including lime manufacture using pyro-processing to calcine the kiln stone in a lime kiln;

c) Downstream processing including crushing, screening, transporting to silos, grinding/milling, hydrating and packing

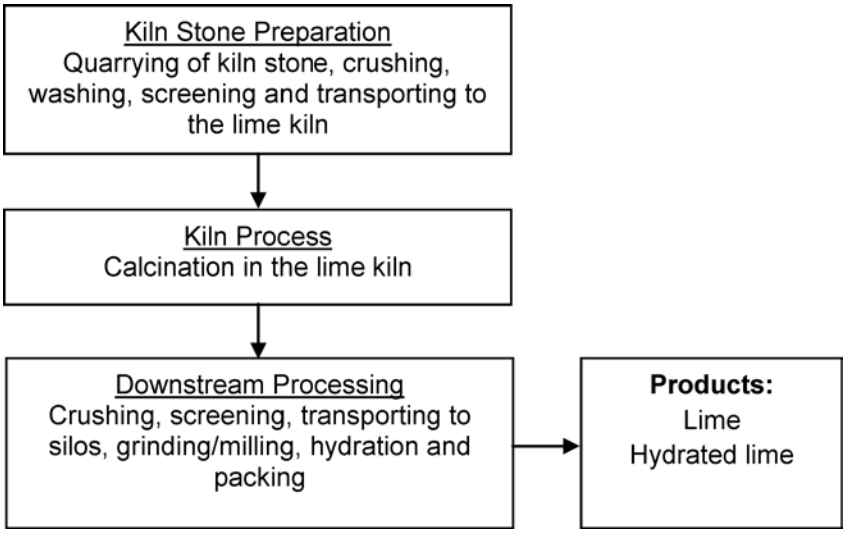

Figure 1 — Process steps in lime manufacture

A lime manufacturing plant may also encompass the use of additional fuel for on-site power generation and for preparation or processing of fuels for use in the plant.

There are two main sources of direct GHG emissions in the lime manufacturing process:

— calcination of kiln stone through pyro-processing in the lime kiln (known as process emissions)

— combustion of kiln fuels (known as combustion emissions)

These two sources are described in more detail below.

Other minor direct emissions of GHG may come from non-kiln fuels such as on-site transport, pumps, room heating,

Minor GHG emissions may come from indirect sources such as from external power production or transport.

For the lime sector, only the greenhouse gas CO_2 is relevant as demonstrated in different field tests. Details about these tests are provided in Annex A.

GHG from calcination of kiln stone (process emissions)

In the lime manufacturing process, CO_2 is released due to the chemical decomposition of calcium, magnesium and other carbonates in the kiln stone:

$$CaCO_3 + heat \rightarrow CaO + CO_2 \quad (1)$$

$$MgCO_3 + heat \rightarrow MgO + CO_2 \quad (2)$$

This process is called "calcining" or "calcination". It results in direct CO_2 emissions through the kiln stack. When considering CO_2 emissions due to calcination, two components can be distinguished:

— CO_2 from kiln stone used for lime production;

— CO_2 from materials leaving the kiln system as partly calcined lime kiln dust (LKD).

The CO_2 from lime production is dependent on the quality of the final lime product, i.e. the degree of calcination. This varies depending on the kiln design and targeted final lime product properties. The amount of LKD leaving the kiln system varies with kiln type. The associated GHG emissions are likely to be relevant and so shall be accounted for.

CO_2 emissions from calcination can be calculated in the following ways which are in principle equivalent:

a) The Input Method - based on the mass of kiln stone entering the kiln and chemical composition of the limestone, lime and LKD leaving the kiln system

b) The Output Method - based on the mass and chemical composition of the lime and LKD leaving the kiln system

GHG from organic carbon in kiln stone

Some kiln stone sources contain a small fraction of organic carbon, which can be expressed as total organic carbon (TOC) content. Organic carbon in the kiln stone is converted to CO_2 during pyro-processing. The contribution of this component to the overall CO_2 emissions is typically very small. The organic carbon contents of kiln stone can, however, vary substantially between locations and needs to be assessed as part of the determination of GHG emissions.

GHG from fuels for kiln operation (combustion emissions)

The lime industry uses various fossil fuels to heat the kiln, including natural gas, coal and fuel oil. In recent years, fuels derived from waste materials have become important substitutes. These alternative fuels (AF) include fossil fuel-derived fractions, such as waste oil, as well as biomass-derived fractions, such as waste wood. Furthermore, fuels are increasingly used which contain both fossil and biogenic carbon, such as municipal and pre-treated industrial wastes or waste tyres (containing natural and synthetic rubber).

Both traditional and AF result in direct GHG emissions through the kiln stack. However, biomass fuels and the biomass component of mixed fuels are considered “climate-neutral” in accordance with IPCC definitions.

GHG emissions from combustion of fuels can be calculated based on the mass, calorific value and chemical composition of fuels entering the kiln.

The basic calculation methods used in this standard are compatible with the 2006 IPCC Guidelines for National Greenhouse Gas Inventories issued by the Intergovernmental Panel on Climate Change (IPCC).

Alternatively, kiln GHG emissions, from combustion, calcination and organic carbon in the kiln stone, can be determined by direct measurement at the kiln stack. Emissions from all sources are determined based on continuous measurement of the concentration of the relevant GHG in the flue gas and of the flue gas volume flow.

GHG from non-kiln fuels (combustion emissions)

GHG emissions from use of fuels in non-kiln applications which are part of the lime manufacturing plant, such as on-site transport, fuel heating, and room heating are determined in a similar way to the GHG from fuels for kiln operation.

GHG from indirect sources

In lime manufacture the main indirect emission source is electricity purchased by the plant but generated off-site. Where kiln stone is imported to the plant, the emissions associated with its manufacture to the plant shall be included within the scope of this standard. The emissions associated with the off-site transport of purchased kiln stone to the plant may be included within the scope of this standard.

6 System boundaries

The operator shall define appropriate boundaries in line with ISO 14064-1 which distinguishes between organizational and operational boundaries.

6.1 Organizational boundaries

Organizational boundaries define which parts of an organization – for example wholly owned operations, joint ventures and subsidiaries – are covered by an inventory, and how the emissions of these entities are consolidated.

The rules for defining Organisational Boundaries in prEN xxx “*Stationary source emissions — Determination of Greenhouse Gas (GHG) emissions in energy intensive industries — Part 1: General aspects”* shall be applied.

In particular, the lime industry shall include the following types of activities:

— Kiln stone preparation including quarrying, crushing, washing, screening and transporting to the lime kiln

— Calcination in the lime kiln

— Downstream processing including crushing, screening, transporting to silos, grinding/milling, hydrating and packing

— Fuel use for on-site power generation; and

— Preparation or processing of fuels in own installations.

6.2 Operational boundaries

Operational boundaries define the types of sources of emissions covered by this standard.

6.2.1 Scopes of emissions to be included

The requirements for including scopes of emissions in prEN xx “Stationary source emissions — Determination of Greenhouse Gas (GHG) emissions in energy intensive industries — Part 1: General aspects” shall be applied.

Subject to the limitations set out in section 6.3 below, the following GHG emissions sources shall be measured for lime manufacturing plantsfacilities:

— All Scope 1 (direct) GHG emissions

— All Scope 2 (indirect) GHG emissions from the generation of purchased electricity

— Scope 3 (other indirect) GHG emissions from the production and transportation of imported kiln stone.

Each lime plant shall undertake an assessment of its Scope 1, Scope 2 and, where relevant, Scope 3 GHG emission sources. The assessment shall include GHG emissions from all stages of the lime manufacturing process undertaken at the plant including kiln stone preparation, calcination and downstream processing of the lime products into ground lime or hydrated lime. Where kiln stone is imported into the site, GHG emissions from its production shall be included.

By way of example, but not restricted to, the following GHG emissions as shown in Table 1 are relevant for a typical lime manufacturing plant:

Table 1 — Relevant GHG emissions for a lime manufacturing plant

	Scope	Process steps
Kiln stone preparation	**Scope 1**	Direct emissions including extraction, quarry operations, transport to stone processing plant, processing (washing, crushing, screening), transport to the lime kiln
	Scope 2	Indirect emissions including extraction, quarry operations including quarry dewatering, transport to stone processing plant, processing (washing, crushing, screening), transport to the lime kiln
	Scope 3	Includes imported kiln stone extraction, quarry operations including quarry dewatering, transport to stone processing plant, processing (washing, crushing, screening), transport to the lime kiln
Kiln Process	**Scope 1**	Direct emissions from the manufacture of lime
		Direct emissions from the production of LKD
		Direct emissions from the combustion of fossil fuels
	Scope 2	Indirect emissions from kiln operation and infrastructure
Downstream Processing	**Scope 1**	Includes transport to silos, grinding/milling, hydrating or packing
	Scope 2	Includes transport to silos, grinding/milling, hydrating or packing

It is not necessary to include the following GHG emissions as these are deemed to be insignificant or out of scope:

— GHG emissions from overburden removal in the quarry,

— GHG emissions from the rehabilitation or restoration of the quarry and plant,

— GHG emission from manufacture and use of explosives during quarrying,

— GHG emissions from the original development of the plant, including the manufacturing the infrastructure

— Scope 3 GHG emissions, other than for kiln stone imported to the plant, e.g. from the production, transportation and distribution of fossil and alternative fuels.

If these GHG emissions are incorporated within the available measured values, and cannot be separately measured, then they shall be included in the reported information.

6.2.2 Structure of plants and processes

The operator shall document all production units at the plant, including the downstream processes, such as grinding and hydration.

If there is more than one type of industry being operated at the plant the operator shall clearly identify the operations associated with lime manufacture.

6.3 Sources and greenhouse gases to be included

All GHG emissions sources necessary for producing lime shall be included.

The following GHG shall be reported as carbon dioxide equivalent (CO_{2e}) using the relevant Global Warming Potential for a time horizon of 100 years (GWP 100 factor), consistent with reporting under the second assessment report of the Intergovernmental Panel on Climate Change (IPCC):

— Carbon dioxide (CO_2).

As demonstrated during different field tests, other GHGs are not relevant for the lime manufacturing. Details about these tests are provided in Annex A.

6.4 Internal lime transfers

Some lime companies transfer lime products internally between different lime plants for further downstream processing, for example, milling/grinding or hydration. These transferred products shall be accounted for in a manner that avoids double counting between different plants or distortion of the performance indicators. Such transfers shall be taken into account in the calculation of the performance indicators.

6.5 Assessment period

Data for determination of GHG emissions and performance indicators shall be collected over a minimum 12 month period. If data are collected over a shorter period this shall be reported by the operator wherever results are published.

7 Principles

Accounting and performance assessment of GHG emissions shall be based on the principles as described in the Introduction to ISO/DIS 19694-1 *Stationary source emissions — Determination of Greenhouse Gas (GHG) emissions in energy intensive industries — Part 1: General aspects.*