CD/T/65/2007
ICS 87.040

EAST AFRICAN STANDARD

Air quality — Emissions to the air by cement factories guidelines

EAST AFRICAN COMMUNITY

First Edition 2010

Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in East Africa. It is envisaged that through harmonized standardization, trade barriers which are encountered when goods and services are exchanged within the Community will be removed.

In order to meet the above objectives, the EAC Partner States have enacted an East African Standardization, Quality Assurance, Metrology and Test Act, 2006 (EAC SQMT Act, 2006) to make provisions for ensuring standardization, quality assurance, metrology and testing of products produced or originating in a third country and traded in the Community in order to facilitate industrial development and trade as well as helping to protect the health and safety of society and the environment in the Community.

East African Standards are formulated in accordance with the procedures established by the East African Standards Committee. The East African Standards Committee is established under the provisions of Article 4 of the EAC SQMT Act, 2006. The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the private sectors and consumer organizations. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the procedures of the Community.

Article 15(1) of the EAC SQMT Act, 2006 provides that "Within six months of the declaration of an East African Standard, the Partner States shall adopt, without deviation from the approved text of the standard, the East African Standard as a national standard and withdraw any existing national standard with similar scope and purpose".

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

East African Community

P O Box 1096

Arusha

Tanzania

Tel: 255 27 2504253/8

Fax: 255-27-2504481/2504255

E-Mail: eac@eachq.org

Web: www.each.int

Introduction

Industrial effluents into the air or water bodies can cause environmental pollution when not treated properly prior to exposure. Some of these effluents are toxic and can directly or indirectly endanger the lives of people, as well as destroying the environment. All efforts should focus on waste minimization. However, when some effluents must be discharged, then this should be done within preset tolerances, in cognizance of their eventual impact on the environment and health. Prior treatment may also be necessary.

A separate East African Standard, CD/T/67/2007, *Tolerance limits of emissions discharged to the air by cement factories* gives the tolerance limits, sampling and reference test methods so that results may be comparable.

This guideline is based on a document originally published by the East African Cement Producers Association (EACPA).

Air quality — Emissions to the air by cement factories guidelines

1 Scope

This East African Standard lists the commonly encountered pollutants in cement factories. It gives the reasons behind these emissions and gives possible options of mitigation.

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.

CD-T-66-2010, *Air quality — Specification*

3 Emissions

The three air-polluting substances most relevant to the manufacture of cement are:

— dust

— oxides of nitrogen (NO_x) and other nitrogen compounds;

— sulphur dioxide (SO_2) and other sulphur compounds;

Cement plant operation and literature on air pollution and abatement techniques generally focus on these three pollutants.

Other pollutants to be considered in relation to the manufacture of cement are

— carbon monoxide (CO)

— volatile organic compounds (VOC)

— polychlorinated dibenzodioxins and dibenzofurans (PCDD and PCDF)

— metals and their compounds

— HF & HCl

— carbon dioxide (CO_2)

Other emissions, the effects of which are normally slight and/or local, are waste, noise and odour. Legislation on these are usually covered under other regulations such as Health & Safety.

The main releases from the production of cement are releases to air from the kiln system. These derive from the physical and chemical reactions involving the raw materials and the combustion of fuels. The main constituents of the exit gases are nitrogen from the combustion air, CO_2 from the calcinations of the calcium carbonate and the combustion of fuel, water vapour from the combustion process, and excess oxygen.

In all kiln systems the solid material moves counter current to the hot combustion gases, this counter current flow thus acting as a built-in circulating fluidized bed. Many of the components resulting from the combustion of the fuel or the transformation of the raw material remain in the gas phase until they are absorbed by or condensed on the raw material. The absorptive capacity of the material varies with its physical and chemical state which in turns, depends on its position within the kiln system. For

instance, material leaving the calcinations stage has a high calcium oxide content and therefore a high absorptive capacity for acid species such as HCl, HF and SO_2.

Emission data from European cement kilns is given in the following table. The ranges of emission depend largely on the nature of the raw materials, the fuels, the age and design of the plant and also, on the requirements imposed by the permitting authority. Unless otherwise specified, all values are in mg/Nm^3 of gas (dry gas, 101.3 kPa, 273 K, 10% 0_2).

Substance	**Emission range**
Dust	5 – 200
No_x (as NO_2)	200 – 3000
SO_2	10 – 3500
CO	500 – 2000
TOC	5 – 500
PCDD/F	0.1 – 0.5 ng/Nm^3
HF	0.4 – 5
HCl	1 – 25
CO_2	400 – 520 g/Nm^3
Metals:	
Hg, Cd, Tl	0.01 – 0.3 (mainly Hg)
As, Co, Ni, Se, Te	0.001 – 0.1
Sb, Pb, Cr, Cu, Mn, V, Sn, Zn	0.005 – 0.3

Typical kiln exhaust gas volumes expressed as m^3/tonne of clinker (dry gas, 101.3 kPa, 273 K) are between 1700 and 2500 for all types of kilns. Suspension preheated and precalciner kiln systems normally have gas volumes around 2000 m^3/tonne of clinker.

4 Sources of pollutants and possible mitigation options

4.1 Dust

Traditionally the emission of dust has been the main environmental concern in relation to cement manufacturing where at all stages of the process, large volumes of gases are flowing through dusty material.

The main source of dust emission is from the kiln stack but there are also releases of dust particulates from kiln coolers and from all milling operations i.e. raw materials, solid fuels and finish product. These are referred to as process dust emissions which can have an impact on the air quality over a fairly large area.

Other dust emissions can arise from outside storage of raw materials and solid fuels as well as from any material transport systems, including cement dispatch. These emissions can be significant if these systems are not well engineered or maintained. This type of dust emission is referred to as fugitive dust which can lead to local nuisance problems.

Various devices are used in older plants to control process dust emissions but for newer installations, only electrostatic precipitators (EP_s) and fabric filters are used.

4.2 Oxides of nitrogen

Oxides of nitrogen are formed from the reaction of oxygen with either the nitrogen in the combustion air (Thermal NO_x) or the nitrogen contained in certain chemically bound compounds in the fuel (Fuel

