TECHNICAL REPORT

RAPPORT TECHNIQUE

TECHNISCHER BERICHT

CEN/TR 14061

June 2021

ICS 65.080

Supersedes CR 14061:2000

English Version

Fertilizers - Determination of dust content

Engrais - Détermination de la teneur en poussière

Düngemittel - Bestimmung des Staubgehaltes

This Technical Report was approved by CEN on 23 May 2021. It has been drawn up by the Technical Committee CEN/TC 260.

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European foreword

This document (CEN/TR 14061:2021) has been prepared by Technical Committee CEN/TC 260 “Fertilizers and liming materials”, the secretariat of which is held by DIN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes CR 14061:2000.

Significant changes between this document and CR 14061:2000 are as follows:

a) modification of the figures to contain neutral language;

b) adaption to current principles and rules for structure and drafting.

This document is published by the European Committee for Standardization. It is published for information only and does not have the status of a European Standard.

The Annexes A and B are informative.

Introduction

0.1 General

In production and handling of fertilizers dust generation is of great concern by both producers and users of the fertilizer products. For health and environmental reasons, it is of great interest to control and reduce the amount of dust generation. In the fertilizer industries there are a wide variety of apparatus for dust determination, most being used as "in-house" methods in plants and laboratories.

The content of this document was developed by CEN/TC 260/WG 2 between 1991 and 2000 in order to develop a standard dust test. A spouting bed apparatus was designed for gravimetric determination of dust, and after two preliminary ringtests a conclusive ringtest involving six laboratories was carried out. Not being able to develop a statistical significant method for the determination of dust, TC 260 decided by resolution 105/1997 to change the deliverable of this work item into a CEN Technical Report. The change of deliverable has been approved by CEN/BT with its resolution BT C172/1999.

0.2 General background

When handling fertilizer grains, dust is at every moment generated on the surface. The fertilizer thus contains more or less free dust, and has a potential for generating more dust (abrasion dust) when subject to subsequent handling.

In all existing gravitational test methods dust will be generated during the testing time, and the two types of dust will be measured simultaneously. The scope of the method is expressed in Annex A and the aim is to:

*"...specify a method for the determination of the **dust potential** of solid fertilizers and is applicable to granular and prilled fertilizers.*

Dust particles, which cause reduced visibility in air are too small to be determined by this method."

0.3 Background for choice of method

Fluidized particle powders are generally divided into four characterizing groups (A, B, C, D) [1]. Group C particles are small, cohesive and are difficult to fluidize. Aeratable powders belong to group A, and many fluidized bed catalysts characterize this group. Sand typifies group B, in which inter-particle forces are negligible, in contrast with group A powders. Large and/or dense particles in general belong to group D, and fertilizer particles (2 mm to 4 mm) in air are in this group. A flow diagram can be used to broadly identify flow regimes appropriate to combinations of gas velocity and particle properties. It can be shown that the fertilizer system is in the lower part of the spouted bed regime.

A criterion that can be used to distinguish between group B and D is the numerical inequality that classifies a powder as spoutable if:

$$(\rho_p - \rho_f) \cdot d_p^{1,24} > 0,23$$

For a typical fertilizer this value will be about 1,4 and about 0,5 for an urea prill.

From previous experiments with other methods based on a fluidized bed and the above calculations, it was decided to base the method upon the spouted bed principle.

1 Scope

This document is applicable to the determination of dust potential of solid fertilizer, obtained in prilling or granulation process. Compacted or crystalline materials were not considered.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Symbols and abbreviated terms

4.1 Technical Symbols

C_D	drag coefficient
d_p	particle diameter, expressed in metres (m)
d_s	average spout diameter, expressed in metres (m)
D_p	average particle diameter, expressed in metres (m)
D	diameter of spouting section, expressed in metres (m)
D_i	inner orifice diameter, expressed in metres (m)
g	gravity, expressed in kilograms per metres per square seconds (kg/m s^2)
H	bed height, expressed in metres (m)
Re	Reynolds number
v_t	terminal velocity, expressed in metres per seconds (m/s)
v_{ms}	minimum spouting height
ρ_p	particle density, expressed in kilograms per metres to the third power (kg/m^3)
ρ_f	fluid density, expressed in kilograms per metres to the third power (kg/m^3)
μ	viscosity, expressed in Newton seconds per square metres (Ns/m^2)