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Karakterizacija blata - Lastnosti filtracije ï 1. del: Ļas kapilarnega vsesavanja

Characterisation of sludges - Filtration properties - Part 1: Capillary suction time (CST)

Charakterisierung von Schlämmen - Filtrationseigenschaften - Teil 1: Bestimmung der kapillaren Fließzeit

Caractérisation des boues - Propriétés de filtration - Partie 1: Détermination du temps de succion capillaire

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Characterisation of sludges - Filtration properties - Part 1: Capillary suction time (CST)

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Foreword

This document (EN 14701-1:2006) has been prepared by Technical Committee CEN/TC 308 “Characterisation of sludges”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2006, and conflicting national standards shall be withdrawn at the latest by September 2006.

Other parts of this European Standard are:

— Part 2: Determination of the specific resistance to filtration;

— Part 3: Determination of the compressibility.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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Introduction

The capillary suction time (CST) is a fast and simple way to evaluate the sludge dewaterability by filtration.

This method gives no information on the obtainable solids content in a dewatering process.

The measurement of CST should also make possible the evaluation, although only qualitatively, of other sludge characteristics, including dewaterability by centrifugation.

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1 Scope

This document specifies a method for the determination of the capillary suction time. This document is applicable to sludge and sludge suspensions from:

— storm water handling;

— urban wastewater collecting systems;

— urban wastewater treatment plants;

— treating industrial wastewater similar to urban wastewater (as defined in Directive 91/271/EEC);

— water supply treatment plants.

This method is also applicable to sludge suspensions from other origin.

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.

EN 12832:1999, *Characterization of sludges — Utilization and disposal of sludges — Vocabulary*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12832:1999 and the following apply.

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3.1
filterability
property indicating the amenability of a sludge to be dewatered by a filtration process

3.2
capillary suction time (CST)
measurement of the time for a wetting front in a filter paper to travel between two fixed points

4 Principle

The principle of the method is that dewatering is achieved by the suction applied to the sludge by the capillary action of an absorbent filter paper.

A part of the absorbent paper area is exposed to the sludge, while the remaining area is free for absorbing the filtrate. The rate at which the paper becomes wetted with filtrate is a measure correlated to sludge dewaterability: it is measured by the time necessary for the filtrate to cover the space between two probes which detect the advancement of the liquid front on the paper (Annex A informative).

The CST measurements are strongly affected by many factors, such as properties of the paper, surface tension, temperature, suspended solids concentration, so they give only qualitative and comparative evaluations which can be correlated to the specific resistance to filtration (prEN 14701-2) for a given type of sludge (Annex B informative).

5 Apparatus

5.1 Standard apparatus

Device consisting of:

a) filtration apparatus, including base for supporting the absorbent paper, sludge reservoir and probes;

b) automatic time recording unit, including amplifier and digital electric stop-clock recording in seconds (see Annex A informative).

5.2 Filter paper

Paper suitable for chromatography with grain parallel with the longer side (for instance, Whatman n. 17 or Wickam CST Papers 7 cm x 9 cm code 868084[1)]).

NOTE For comparable results the same filter paper type should be used.

5.3 Beakers

Conventional beakers, 50 ml minimum.

6 Procedure

6.1 Place a filter paper in the apparatus. The filter paper shall always be placed with the same side up.

6.2 Mix the sludge to be tested by pouring it off from a beaker to another for 4 times.

6.3 Pour immediately the mixed sludge into the reservoir until it is completely full. Great attention shall be paid in performing measurements immediately after the sludge mixing to avoid any result unreliability due to sludge settling into the beaker (especially for conditioned sludges).

6.4 When the clock stops, register the time which has been automatically measured.

6.5 Repeat steps 6.1 to 6.4 in order to have at least 3 significant values, as stated in Clause 7.

7 Expression of results

The CST value is given by arithmetically averaging the measured values. If one or more values differ of more than 20% from the calculated mean value, they must not be considered and the average shall be calculated again with remaining values: in any case valid values shall be, at least, 3.

The influence of the temperature may be evaluated through the relationship:

$$CST_1 = (\mu_1/\mu_2)\, CST_2 \qquad (1)$$

where

μ_1 and μ_2 are the dynamic viscosities of water at the two considered temperatures.

1) This information is given for the convenience of users of this document and does not constitute an endorsement by CEN of this product. Equivalent products may be used if they can be shown to lead to the same results.

If the room temperature is between 12 °C and 30 °C, the influence of the temperature can be neglected.

Water viscosities as a function of temperature are reported in the table in Annex D (informative).

8 Precision

Results of validation trials are summarized in Annex E (informative).

The repeatability standard deviation ranges from 0,411 s (3,6 %) for activated/thickened sewage sludge, to 0,463 s (4,4 %) for activated sewage sludge, to 1,560 s (3,4 %) for waterworks sludge, and to 7,856 s (5,3 %) for digested sewage sludge.

Mean value is 2,573 s (4,9 %). Minimum precision is 5,3 %.

The reproducibility standard deviation ranges from 0,643 s (5,6 %) for activated/thickened sewage sludge, to 1,043 s (9,9 %) for activated sewage sludge, to 2,023 s (4,4 %) for waterworks sludge, and to 20,01 s (14,0 %) for digested sewage sludge.

Mean value is 5,929 s (11,3 %). Minimum precision is 14,0 %.

9 Test report

The test report shall contain the following information:

a) reference to this document;

b) all information necessary for the complete identification of the sludge sample;

c) details of sample pre-treatment, if carried out;

d) information about the size of the reservoir used;

e) results of the determination according to Clause 7;

f) any detail not specified in this document or which are optional and any other factor which may have affected the results.

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Annex A
(informative)

Simple automatic instrument for determining the filterability of sewage sludge

The CST apparatus by Triton as described in [1] consists of a base supporting a rectangular piece of 7 cm x 9 cm of absorbent filter paper and a block holding probes above it; in the centre of the upper block (which stands clear of the paper by resting on five stainless steel supports) there is a circular hole in which a stainless steel reservoir (18 mm bore/25 mm high or 10 mm bore/50 mm high) loosely fit. On the under side of the upper block there are two engraved circles, of 3,2 cm and 4,5 cm in diameter, concentric with the reservoir; two of the supports are specially machined probes in line with the first concentric circle and one with the second circle. Both probes are electrically connected to the recording unit.

For this apparatus, the CST values of raw sewage sludge generally range 60 s to 300 s, using the 18 mm reservoir and the kind of papers reported before (see 5.2).

The 18 mm reservoir is more suitable for low-dewaterable sludges: significant values range 10 s to 900 s.

The use of the 10 mm reservoir is necessary for easily filterable sludges: significant values range 20 s to 1 200 s.

For high filterable sludges, having very low CST, 2 overlapped filter papers could be used.

The 10 mm reservoir can be difficult to fill, especially with thick sludges. The 18 mm reservoir has been found to be suitable for use with most sewage sludges, but other dimensions may be more suitable for other types of suspension.

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