

Characterisation of sludges - Settling properties - Part 3:
Determination of zone settling velocity (ZSV)

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NATIONAL FOREWORD

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English Version

Characterisation of sludges - Settling properties - Part 3: Determination of zone settling velocity (ZSV)

Caractérisation des boues - Propriétés de
sédimentation - Partie 3 : Détermination de la vitesse
du front de sédimentation (ZSV)

Charakterisierung von Schlämmen -
Absetzeigenschaften - Teil 3: Bestimmung der
Sinkgeschwindigkeit

This European Standard was approved by CEN on 14 December 2018.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN 14702-3:2019) has been prepared by Technical Committee CEN/TC 308 “Characterization and management of sludge”, 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of an identical text or by endorsement, at the latest by August 2019, and conflicting national standards shall be withdrawn at the latest by August 2019.

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.

The EN 14702 series consists of the following parts:

- *Characterisation of sludges — Settling properties — Part 1: Determination of settleability (Determination of the proportion of sludge volume and sludge volume index);*
- *Characterisation of sludges — Settling properties — Part 2: Determination of thickenability;*
- *Characterisation of sludges — Settling properties — Part 3: Determination of zone settling velocity (ZSV).*

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Introduction

In wastewater treatment plants, sludge thickening occurs in the lower layers of clarifiers and in separate thickening tanks. Due to wide variation in sludge settling properties, design criteria for these processes are mostly based on batch thickening tests.

A number of parameters have been developed to obtain a quantitative measure of the settleability of sludge. All of these tests are based on one of two basic approaches.

The first approach uses the volume of the sludge occupied after a fixed period of settlement. In this approach laboratory tests [1], [2] are conducted by allowing a sludge to thicken in a small graduated cylinder, without (SVI: Sludge Volume Index) or with stirring (SSVI: Stirred Sludge Volume Index) and evaluating the proportion of the sludge volume is recorded. These characterization tests are easily performed and have a widespread use in routine process control for sludge quality comparison in settling tanks or by scientists who tried to correlate these indexes to sludge velocity and to aid thickeners and settling basin design [3]. The use of these indexes for sizing/optimizing decanters and static thickeners should be done with care as they are influenced by laboratory artefacts (channelling and bridging effects, turbulences caused by filling, shallow depth by partial support through the solids from the bottom to the vessel, impact of stirring on sludge) [4].

The second approach uses the subsidence velocity of the solid/liquid interface of the sludge at its initial concentration calculated from the straight-line portion of the resulting curve. This parameter should be measured in large-diameter columns having a depth with the same order of magnitude as industrial thickener. Following the interface between the solid and liquid phase enables the determination of the (zone) settling (or sedimentation) velocity (SV) of the sludge (initial slope of the curve) and compression point (intersection of the linear sedimentation zone and the asymptotic falling zone). The use of sedimentation curve data after the compression point enables to calculate the required time and theoretical area of the thickener to obtain the desired sediment concentration [5].

The sedimentation velocity and compression point are basic parameter for decanters/static thickeners sizing [6] and are linked directly to phenomena occurring in the industrial devices. This measurement can evaluate the impact of sludge chemical conditioning on the size and design of the thickener or on the process productivity. A decanter/thickener well sized will enable further sludge treatment as lowest cost for its volume reduction.

1 Scope

This document specifies a method for determining the zone settling velocity (ZSV) and the Compression point.

This document is applicable to sludge and sludge suspensions from:

- storm water handling;
- urban wastewater collecting systems;
- urban wastewater treatment plants;
- 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 and sludge suspensions of other origins.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 14742, *Characterization of sludges — Laboratory chemical conditioning procedure*

EN 16323, *Glossary of wastewater engineering terms*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 16323 and the following apply.

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

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

settleability

ability of solids of a suspension to separate from water under gravity

3.2

zone settling (or sedimentation) velocity

ZSV

vertical distance covered by a group of particles per time unit

3.3

compression point

critical time in a sedimentation under gravity where the sludge in the thickening zone begins to compress

3.4

theoretical thickener area

required area per unit of solids and time to concentrate sludge according a given factor