SLOVENSKI STANDARD
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Ļistilne naprave za odpadno vodo ï 6. del: Postopek z aktivnim blatom

Wastewater treatment plants - Part 6: Activated sludge process

Kläranlagen - Teil 6: Belebungsverfahren

Stations d'épuration - Partie 6: Procédé a boues activées

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Wastewater treatment plants - Part 6: Activated sludge process

Stations d'épuration - Partie 6: Procédé à boues activées

Kläranlagen - Teil 6: Belebungsverfahren

This European Standard was approved by CEN on 9 November 2001.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 165 "Wastewater engineering", the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by July 2002, and conflicting national standards shall be withdrawn at the latest by December 2002.

In this standard the annex A is informative.

It is the sixth part prepared by the Working Groups CEN/TC 165/WG 42 and 43 relating to the general requirements and processes for treatment plants for a total number of inhabitants and population equivalents (PT) over 50. The Parts of the series are as follows:

— Part 1: General construction principles

— Part 3: Preliminary treatment

— Part 4: Primary settlement

— Part 5: Lagooning processes

— Part 6: Activated sludge processes

— Part 7: Biological fixed-film reactors

— Part 8: Sludge treatment and storage

— Part 9: Odour control and ventilation

— Part 10: Safety principles

— Part 11: General data required

— Part 12: Control and automation

— Part 13: Chemical treatment – Treatment of wastewater by precipitation/flocculation

— Part 14: Disinfection

— Part 15: Measurement of the oxygen transfer in clean water in aeration tanks of activated sludge plants

— Part 16: Physical (mechanical) filtration[1)]

NOTE For requirements on pumping installations at wastewater treatment plants, provided initially as Part 2 "Pumping installations for wastewater treatment plants", see EN 752-6 "Drain and sewer systems outside buildings — Part 6: Pumping installations".

EN 12255-1, EN 12255-3 to EN 12255-8 and EN 12255-10 and EN 12255-11 were implemented together as a European package (Resolution BT 152/1998).

[1)] In preparation.

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

1 Scope

This European Standard specifies the performance requirements for treatment of wastewater using the activated sludge process for plants over 50 PT.

Differences in wastewater treatment throughout Europe have led to a variety of systems being developed. This standard gives fundamental information about the systems; this standard has not attempted to specify all available systems.

Detailed information additional to that contained in this standard may be obtained by referring to the bibliography.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 1085, *Wastewater treatment — Vocabulary.*

EN 12255-1, *Wastewater treatment plants — Part 1: General construction principles.*

EN 12255-10, *Wastewater treatment plants — Part 10: Safety principles.*

EN 12255-11, *Wastewater treatment plants — Part 11: General data required.*

prEN 12255-12, *Wastewater treatment plants — Part 12: Control and automation.*

3 Terms and definitions

For the purposes of this European Standard the terms and definitions given in EN 1085 apply.

4 Requirements

4.1 General

The biological reactors and the clarifiers connected by the return sludge recirculation form a unit process - the activated sludge process. The performance of the process depends on the biological and chemical reactions in the activated sludge tanks as well as the separation of the activated sludge in the final clarifiers.

NOTE Biological treatment and clarification may be combined in the same tank e.g. a sequencing batch reactor (SBR).

The design shall take account of the requirements specified in EN 12255-1, EN 12255-10, EN 12255-11 and prEN 12255-12.

4.2 Planning

The following factors shall be considered in the design of an activated sludge treatment plant:

— the capacity and dimensions of the biological reactors;

— the prevention of dead zones and detrimental deposition in tanks/channels;

— the establishment of multiple lines/units or other technical means to ensure maintenance of required final effluent quality if one or more line/unit is out of operation;

— the aeration and/or mixing equipment;

— the surface area , volume and depth of the clarifiers ;

— sludge removal system within the clarifier;

— the sludge recirculation and excess sludge wasting equipment;

— the treatment and final destination of the sludge produced;

— measurement and control;

— the head loss to be minimised.

The structures shall be designed to allow emptying either by gravity flow or by pumping. Emptying shall not affect the stability of structures, irrespective of the groundwater level. All necessary measures shall be taken such as ballast concrete, floor check valve or provision for temporary lowering of the groundwater.

It can be useful to design the floor to slightly incline towards the lowest points.

When a pump is used for emptying a drain pit may be built into these low points.

4.3 Flow-splitting structure

When the process involves multiple lines or parallel units, the incoming flow shall be distributed by an adjustable distribution device (e.g. valve, gate, stop-log) that can also be used to isolate each treatment unit.

This device shall provide the required flow distribution over the range of flow rates considered.

NOTE The accumulation and removal of floating matter can be considered at this stage.

4.4 Biological reactor

4.4.1 Design

The number, shape and capacity of the reactors achieving the main biological reactions can vary considerably according to:

— the size of plant;

— the level of treatment to be achieved e.g. carbonaceous removal, nitrification, denitrification and phosphorus removal;

— the anoxic stage, with respect to nitrogen removal;

— the dosage of precipitant and/or the anaerobic stage with respect to phosphate removal.

The hydraulic design shall minimise short-circuiting. The reactor flow pattern depends on the process selected. In the case of multipoint feed (e.g. step-aeration), appropriate devices (e.g. valves, gates, stop-logs) shall be provided to allow modification of the original flow-splitting arrangement.

When the plant is designed for one or more reactors to be taken out of service for routine maintenance, the reactors remaining in operation and their associated pipework, channels, etc., shall have the hydraulic and treatment capacity to accommodate all the incoming flow.

A selector where return sludge and wastewater are brought into a short period of contact can reduce the growth of filamentous bacteria and improve the growth of flocculant bacteria. Owing to the short contact time, the content shall be mixed efficiently. Where intermittent pumping exist the influent and return sludge shall arrive at the same time.

4.4.2 Operational parameters

The following operational parameters shall be considered and should be appropriate for the level of treatment required:

— the mixed liquor suspended solids concentration (MLSS) or the mixed liquor volatile suspended solids (MLVSS);

— the sludge age;

— the sludge loading (F/M);

— the sludge volume index (SVI) e.g. stirred (SSVI) or diluted.

NOTE Further information is available in the references listed in the Bibliography.

4.4.3 Mixing

Mixing can be performed by the aeration devices themselves (e.g. surface aerators, air-diffusers), by separate mixing devices or by the two together. Individual mixing devices should be capable of being removed without emptying the tank. The contents of the aeration tank shall be mixed to prevent activated sludge from settling or forming detrimental deposits.

If aeration is not continuous, the devices shall have the capacity to maintain or resuspend the mixed liquor.

Mixers should be designed to minimise fouling by fibrous materials.

The choice of device depends on the characteristics of the wastewater to be treated and the mixed liquor concentration required. More powerful devices can be required in cases where the activated sludge process is not preceded by primary settlement.

4.4.4 Aeration

In the absence of complementary mixing devices, aeration devices shall have the capacity to provide sufficient agitation to thoroughly mix the biomass, the pollutants and the dissolved oxygen.

The dimensioning of the aeration devices and the tanks should ensure both the adequacy of mixing of the activated sludge mixed liquor and the energy efficiency of the process.

If pure oxygen is used in aeration:

— all necessary safety precautions shall be taken;

— explosive gas monitoring and explosion proof equipment shall be provided;

— specific safety signs shall be displayed.

It shall be verified that the power input of the aeration device, derived from aeration requirements, is not lower than the power required to ensure adequate mixing conditions at all times (unless alternative arrangements are in place for the mixing process).

Air diffusers shall be installed to ensure a uniform depth of immersion.