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Karakterizacija blata - Ravnanje z blatom glede na uporabo ali odlaganje

Characterization of sludges - Sludge management in relation to use or disposal

Charakterisierung von Schlämmen - Management von Schlamm zur Verwertung oder Beseitigung

Caractérisation des boues - Gestion des boues en vue de leur valorisation ou de leur élimination

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Foreword

This document (CEN/TR 13714:2010) has been prepared by Technical Committee CEN/TC 308 "Characterization of sludges", the secretariat of which is held by AFNOR.

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

This document supersedes CR 13714:2001.

This document gives recommendations for good practice but existing national regulations remain in force.

Introduction

The purpose of this Technical Report is to outline the management of sludges both upstream and downstream of the treatment process to ensure that it is suitable for the outlets available. Sludge is the inevitable residue of treating raw potable water and municipal and industrial wastewaters. The Technical Report refers to all types of sludge covered by CEN/TC 308 including sludges from treating industrial wastewater similar to urban wastewater and from water supply treatment work plants. In considering the likely quality of sludges it should be remembered that municipal wastewater sludges are composed of materials that have already been disposed of and are consequently likely to be more variable than many industrial sludges that arise from sourced materials or water treatment sludges arising from surface water or groundwater.

The quality of the sludge should match the requirements of the outlets whether that be to land, thermal processing or as a last resort landfill. As a general rule a sludge of high quality is likely to be acceptable to a large range of outlets giving greater operational flexibility. High quality sludges are likely to be suitable for those outlets associated with maximum sustainability and minimum environmental pollution. The management of sludges will become increasingly more complex as environmental standards become more stringent and if outlets become more constrained by legislation and public attitudes.

Sludge quality is central to the development of good practice for sludge production in relation to its destination (use or disposal). Sludge quality depends on the composition of the upstream materials and the type of treatment including post treatment storage.

Sludge quality can be characterised by its different properties; biological, chemical and physical:

— biological properties include the microbiological stability of the organic matter in the sludge, odour and hygienic characteristics;

— chemical properties include:

  — content of potentially toxic substances (PTSs) which include inorganic (metals, metalloids, and other minerals), and organic pollutants;

  — concentrations and form (availability) of plant nutrients and the main components of the sludge;

— physical properties include whether liquid, semi-solid (pasty-like) or solid, and aesthetic factors associated for instance with removal of unsightly debris by effective screening. Calorific value is a quality criterion if the sludge is to be incinerated or used as a fuel. Other physical properties include, thickenability and dewaterability.

The consistency of these different properties is a critical aspect of the sludge quality and of the ability to determine its end destination (use or disposal).

Standard methods should be used where these are available to measure the quality parameters of sludge. There is a continuing need to develop a full set of standardised and harmonised methods which the manager and operator can use to evaluate the quality of sludge for treatment process design and operational purposes.

This Technical Report considers the management of sludges against the waste hierarchy, the management of sludge quality and an option evaluation process to determine the options available.

1 Scope

This Technical Report gives guidance for dealing with the production and control of sludge in relation to inputs and treatment and gives a strategic evaluation of recovery, recycling and disposal options for sludge according to its properties and the availability of outlets.

This report is applicable for sludges from:

— storm water handling;

— night soil;

— urban wastewater collecting systems;

— urban wastewater treatment plants;

— treating industrial wastewater similar to urban wastewater (as defined in Directive 91/271/EC [1]);

— water supply treatment plants;

but excluding hazardous sludges from industry.

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 1085:2007, *Wastewater treatment — Vocabulary*

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

3 Terms and definitions and abbreviated terms

For the purposes of this document, the terms and definitions given in EN 1085:2007 and EN 12832:1999 and the following apply:

3.1
industrial wastewater
trade wastewater
trade effluent
wastewater discharge resulting from any industrial or commercial activity

3.2
urban wastewater
municipal wastewater
wastewater from municipal areas consisting predominantly of domestic wastewater and additionally it may also contain surface water, infiltration water, trade or industrial wastewater

3.3 Abbreviated terms

The following abbreviated terms necessary for the understanding of this report apply:

BOD: Biochemical Oxygen Demand

BPEO: Best Practicable Environmental Option

COD: Chemical Oxygen Demand

EQO/EQS: Environmental Quality Objectives/Environmental Quality Standards

PTS: Potentially Toxic Substance

4 Waste hierarchy

4.1 General

In order that the management of waste be conducted in an increasingly sustainable manner, the EU encourages a waste hierarchy as a framework by which Member States should develop their strategy for waste management (EU Directive 75/442/EEC (see [2]) as amended by 91/156/EEC (see [3])).

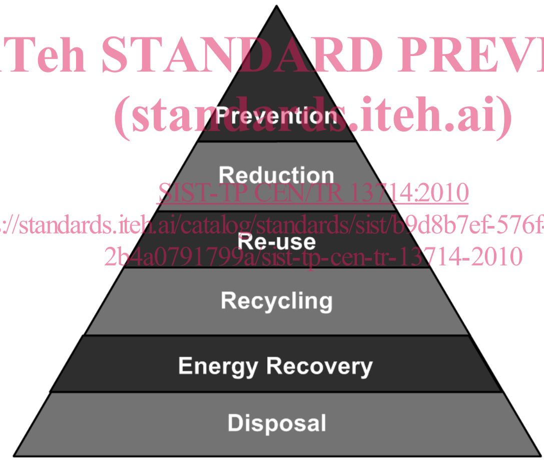

Figure 1 — The waste hierarchy — Including sludges

This hierarchy encourages:

a) firstly, the prevention or reduction of waste production and its harmfulness, in particular by:

— development and implementation of clean technologies more sparing in their use of natural resources;

— technical development and marketing of products designed so as to make no contribution or to make the smallest possible contribution, by the nature of their manufacture, use or final disposal, to increasing the amount or harmfulness of waste and pollution hazards;

— development of appropriate techniques for the final disposal of dangerous substances contained in waste destined for recovery;

b) secondly, the best possible use of waste:

- recovery of waste by means of recycling, re-use or reclamation or any other process with a view to extracting secondary raw materials;

- or the use of waste as a source of energy.

The hierarchy places disposal as the last management choice.

Four of the stages within the hierarchy can be applied to sludges, namely reduction, recycling, recovery and disposal. Obviously, the latter is the least desirable and efforts should be made to minimise the proportion of sludge which is disposed of, by the adoption of clean technologies, recycling and recovery strategies.

The waste hierarchy can be applied equally to activities upstream of the sludge production process and to the processes employed within the treatment process. These are discussed separately below. In considering what management options should be selected, all stages in the sequence of sludge production and its ultimate fate should be scrutinised.

4.2 Context

The overall objective of a sludge management strategy should be to find outlets for the sludge which are safe, environmentally acceptable (carbon foot print), secure and economic. The availability of outlets (see Clause 8) determines how sludge should be treated.

In order to do this, it is important to address quality (Clause 5) and management processes (Clause 6) and operational practices (Clause 7).

5 Management of sludge quality - Upstream processes

5.1 General

The significant difference between municipal sludges and industrial sludges and to a certain extent water treatment sludges is the degree and complexity of control over the inputs.

Industrial sludges usually arise from the processing of sourced materials and control over their content and consequently on the quality of sludge can often be made by analysis of the materials and in many cases by the imposition of quality standards on them. This may not always be possible for instance in the amount of bacteriocides and fungicides in paper waste collected for recycling which could vary from batch to batch. River waters can carry a range of pollutants which could enter the sludge and operators should be aware of the potential pollutants that could enter the river upstream.

5.2 Municipal wastewater sludges

For municipal wastewater sludges strict limits should be imposed on industrial and commercial discharges to the sewer so that the sludge produced from wastewater is ‘clean’ or as free as possible of contaminants of industrial origin.

Industrial point sources of contaminants discharging to the sewer should be identified and restricted or stopped. Key factors are careful discharge consent settings (see below) monitoring and inspection backed by enforcement. Quality assurance in support of the consent requires adequate sampling to check compliance. The extent of sampling of effluent from industrial premises should be decided on a risk assessment basis taking account for instance of size of operation and quantity of chemicals in use.

The "polluter pays" principle should be used to oblige industries failing to produce acceptable effluents to investigate and implement remedial measures. This may entail a change in the production process or the installation on the industrial premises of effluent treatment plant. Often the cost of this is offset by reduced payments for effluent discharge and the recovery and reuse of valuable chemicals that would otherwise have been discharged to the sewer. Experience has shown that by progressively identifying and controlling point source discharges, the quality of sludge can be substantially improved by reducing its content of PTS.

Emergency planning should make provision to deal with accidental discharges of large amounts of polluting chemicals to the sewer so that contamination of sludge is minimised, and the biological treatment processes of wastewater and sludge are protected.

Conventional wastewater treatments remove most of the organic polluting load of the wastewater; this is measured in terms of BOD or COD. These processes also transfer much of the non-treatable polluting load, consisting of non-degradable or persistent residues, out of the wastewater and into the sludge. This is advantageous for the production of clean effluent but if the wastewater contains significant levels of contaminants of industrial origin then these contaminants are likely to be found in the sludge at levels, which affect its environmental suitability for use and disposal outlets. Some of the PTS contained in an untreated wastewater is found in the sludge after treatment. The percentage of the wastewater load of PTS transferred into sludge depends on many parameters, such as the wastewater and sludge treatment process, pH, solids content, and PTS content.

5.3 Setting limits for discharges from industrial and commercial premises to municipal sewers

The use of public wastewater systems is regulated by the operators according to the relevant legislation in place in all the EU Member States and through by-laws, public law agreement or private law operating conditions.

The EU legislation covering the control of potentially toxic substances in discharges to the aquatic environment is Directive 2006/11/EC [4] and Directive 2000/60/EC [5] known as the Water Framework Directive (WFD). These directives should therefore be the springboard for controlling the discharge of toxic and harmful materials from industry and commercial activities. There should be an effective control of the discharge from the wastewater treatment process and the quality of the sludge emanating from it.

Directive 2006/11/EC introduces two lists of 132 dangerous substances to limit discharges from industrial and commercial premises:

List 1 Substances (e.g. mercury, cadmium, organophosphorus compounds and organochlorine compounds) should be removed as completely as possible from all industrial wastewater discharges using the best available technology (BAT). Whenever possible, List 1 substances should be replaced by more benign and less toxic alternatives.

List 2 Substances (e.g. copper, chromium, zinc, and nickel) should be reduced in discharges by the application of the «Best Available Technology Not Entailing Excessive Cost» with respect to the level of environmental risks. A cost/benefit analysis is therefore an essential element in deciding the appropriate level of treatment.

Annex 10 of Directive 2000/60/EC sets out a list of 33 priority substances or group of substances selected amongst those which present a significant risk to or via the aquatic environment. For those pollutants, specific control measures are required that aim for the progressive reduction and for 11 priority hazardous substances the cessation or phasing-out of discharges, emissions and losses.

Directive 2008/105/EC [6] amending the Water Framework Directive 2000/60/EC (WFD) establishes environmental quality standards for priority substances and other substances from Directive 2006/11/EC. Reduction of the pollution by these substances must be assessed through inventories of their discharges, emissions and losses. This text also proposes a list of 13 substances for their identification as priority or hazardous priority substances. Directive 2006/11/EC is repealed by the WFD as from the end of 2013.

Requirements for these dangerous substances are the subject of varying national regulations. In all cases, dangerous substances should be reduced at source as far as possible by suitable pre-treatment of the industrial waste stream prior to discharge to sewer.

Improvements in environmental protection as regards both sludge recycling or disposal, and discharges from treatment plants to the watercourse, require the periodic review of industrial and commercial discharge permit conditions.

5.4 Other factors

5.4.1 General

Factors additional to sludge quality have to be considered in setting limits for chemicals in industrial discharges to the sewer. These are given below.

5.4.2 Protection of biological municipal wastewater treatment processes

Biological processes depending on the action of bacteria and other micro-organisms include biofilm processes and activated sludge. The chosen threshold values for individual contaminants from industrial and commercial discharges should be protective enough to avoid damage to the biota with the consequent failure of the biological wastewater processes.

5.4.3 Protection of biological sludge treatment processes

This normally applies to anaerobic digestion but also to sludge treated by aerobic processes such as composting. Heavy metals and organic contaminants such as pentachlorophenol have been found to inhibit anaerobic digestion of sludge.

It is not easy to designate threshold values for individual contaminants above which biological wastewater or sludge treatment processes may fail because this depends also on the composition of the wastewater, operating conditions and whether the plant is acclimatised to the contaminant. It is now the case that in order to meet sludge quality requirements for use or disposal, concentrations of PTS in wastewater must be restricted to levels below those which would be expected to adversely affect biological wastewater or sludge treatment processes.

5.4.4 Protection of environmental quality in the receiving watercourse

The maximum permissible concentrations of substances discharged to the wastewater given by the national regulations have to be related to the standards set for the final discharge effluent from the wastewater treatment works including storm water overflows from the sewerage system, and those for the receiving watercourse.

5.4.5 Protection of sewer fabric

This is usually controlled by limits for the acidity, alkalinity and temperature of discharges and their content of sulphate and sulphide.

5.4.6 Protection of sewer maintenance workers

Personnel should observe the normal rules of hygiene and it is necessary that chemicals which could generate toxic fumes in the sewer are strictly controlled.

5.5 Minimising contamination including diffuse sources in municipal wastewater

There are sources of contamination of municipal wastewater and sludge other than industrial and commercial discharges to the sewer. These are inputs among others from domestic sources and from runoff from roads etc. and they are diffuse and less readily controlled than point source inputs.

A programme of public education to minimise discharge of unsuitable substances and materials into domestic wastewater can advantageous.