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Karakterizacija blata - Dobra praksa za uporabo blata v kmetijstvu

Characterization of sludges - Good practice for sludge utilisation in agriculture

Charakterisierung von Schlämmen - Leitfaden für die Verfahrensweise bei der Verwendung von Schlämmen in der Landwirtschaft

Caractérisation des boues - Bonne pratique pour la valorisation des boues en agriculture

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This Technical Report was approved by CEN on 9 February 2010. It has been drawn up by the Technical Committee CEN/TC 308.

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Foreword

This document (CEN/TR 13097:2010) has been prepared by Technical Committee CEN/TC 308 “Characterisation 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 13097:2001.

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

1 Scope

This Technical Report describes good practice for the use of sludges in agriculture (where national regulations permit). It is applicable to all of the sludges described in the scope of CEN/TC 308 (and any of the forms in which they may be presented - liquid, dewatered, dried, composted, etc.) i.e. 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.

Such sludges may be used on land as a source of plant nutrients, and/or soil improver, and/or alkaline amendment for crop production. Despite differences in the statutory controls between sewage sludge and other sludges, the use of all types of sludge should follow good practice to maximise benefits for the crops or soils, to minimise potential risks of environmental contamination and adverse impacts on plant, animal and human health, and to ensure sustainability, energy efficiency and cost-effectiveness.

Sludge producers should be aware that if a sludge is used as a fertilising or alkaline amendment, national or EU fertiliser or liming regulations may apply.

The document assumes that an evaluation of sludge utilisation has already been made, and a decision was taken that use of sludge within a land spreading policy is the best option.

For evaluation and decisions for use of sludges, other documents have been developed (see CR 13714, CR 13846).

Many countries and/or local administrations have regulations and/or standards and/or codes of practice applicable to the use of some of the types of sludge that are within the scope of this Technical Report, however it cannot, and does not, attempt to summarise or take account of these regulations, etc. because of their very wide range. It is thus essential that this Technical Report is read in the context of the conditions that prevail locally.

NOTE Adoption in France in 2002 of a standard for standardized composts containing substances from wastewater treatment NF U44-095: *Organic soil improvers – Composts containing substances useful for agriculture, stemming from water treatment*.

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*

CEN/TR 15809, *Characterization of sludges — Hygienic aspects — Treatments*

3 Terms and definitions

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

3.1
potentially toxic substances (PTS)
substances which, when present in excess and in forms that are available to the subject in question, can be toxic

(CEN/TR 15584)

3.2
BPEO
best practicable environmental option

4 Requirements

4.1 General

The purpose of this Technical Report is to assist sludge utilisation operations to:

a) achieve compliance with 86/278/EEC and other environmental legislation or codes of good practice which are relevant to the type and use of sludge or to the location of operations;

b) gain and maintain the confidence of users, authorities responsible for monitoring regulatory compliance, food purchasing and/or processing companies and third parties which (amongst others) include members of the public (particularly those local to where the sludge is applied);

c) make maximum use of the valuable constituents in the sludge;

d) have a long term sustainable solution with minimum cost and maximum benefit to the environment consistent with the above.

Considerations of treatment, source control of pollutants and preparation of sludges are discussed in CEN/TR 13714, CEN/TR 15473 and CEN/TR 15809.

The widely recognised waste management hierarchy recommends, in general, the utilisation of sludge as preferable to disposal options such as landfill. Where agricultural land is available and conveniently accessible, this is usually the best practicable environmental option.

Sludges usually contain nutrients, organic matter and trace elements, which are beneficial to the growth of crops (including energy crops and grass) and to the fertility, structure and/or texture of soils. They are therefore valued by farmers. Sludges may contain contaminants, and/or pathogens, and may be odorous. Consequently, the whole process (from source control of potential pollutants, through sludge treatment, to sludge application and the way the land is farmed) should be controlled to avoid adverse impacts on the environment, or on plant, animal and human health. Such safe controlled use of sludge on land can be considered a component of sustainable development.

Many European countries have developed guidelines and regulations for the safe use of sewage sludge. These have been placed on a common statutory basis in the European Union through the implementation of the EU Directive 86/278/EEC which requires certain limit values for PTSs in soil and sludge. Other EU legislation encourages the utilisation of suitable industrial sludges on land provided measures are taken to avoid endangering human health or harming the environment (91/156/EEC [3] amending Directive 75/442/EEC on waste). However, unlike the situation for sewage sludge, there is little detailed information available and there is less legislative control for these other sludges. In the past the emphasis has been on preventing chemical pollution, but whilst this is still essential, the modern agenda also includes hygiene

(CEN/TR 15809), and the need to demonstrate safety through quality assurance and independent validation. European legislation has effectively eliminated many hazardous substances from products and the environment. The REACH programme [4] continues the control on hazardous substances at source.

In order to establish and maintain cost-effective, safe and sustainable operations using sludge in agriculture, certain procedures should be established for effective operational management, to meet legal requirements and to address the concerns of stakeholders.

This document has been constructed in an order that attempts to reflect the logical steps of a successful (which also means sustainable) sludge utilisation operation. It starts with the initial steps in designing an operation, and then considers the quality control, design, etc., before moving on to the day-to-day operations. Although marketing (finding outlets) and support are also continuing activities they are treated in separate sections because they are general and not particular to each individual outlet. Despite this linear structure, continuous improvement is recognised as an important component, which therefore implies the cycle of design, operate, review, refine, operate, review, etc.

4.2 Preliminary procedures

4.2.1 General

This section discusses the more significant procedures and considerations for setting up a new programme to use sludge in agriculture or modifying an existing one. These would include understanding the relevant regulations within which the sludge is used, the quantity of the sludge, the quality of the sludge, whether there are programmes for ensuring sludge quality, and whether there would be demand for the sludge; including whether there are competing materials, e.g. animal manure or compost and biogas residues of other materials.

4.2.2 National regulations

In the case of sewage sludge, national regulations set quality standards for the receiving soil and may set standards for the sludge. The specific values and combinations of control mechanisms vary between countries, and a combination of sludge, waste management, water and general agricultural and environmental regulations may apply. Few countries have comprehensive regulations to control all sludges that may have similar environmental impacts. Those using sludges should make themselves aware of the regulations that apply in the areas where they are working. CEN/TC 308 has compared and discussed different sludge treatment operating parameters in CR 13846.

4.2.3 Voluntary agreements

In some countries, some sludge producers have gone beyond national regulations by voluntarily entering agreements with interested parties (such as food retailers and processors, farmers and landowners). These agreements have addressed the question of perception and increased the acceptance of using sludge in agriculture. Any applications of sludge should be consistent with these agreements.

4.2.4 Quality assurance

It is recommended that there should be a quality assurance system for the whole process from source control of potential pollutants, through sludge treatment and spreading, and finally to how the land is farmed. To prove transparency and ensure the confidence of stakeholders, it is desirable that this is validated by an independent audit.

The principal criteria should include:

a) sludge quality, particularly:

- control of potential pollutants from point sources;
- sampling and analysis strategy to monitor sludge quality (PTSs, pathogens and its fermentability (i.e. potential to produce bad odours);
- treatment of sludge.

b) soil quality, particularly:

- a soil sampling strategy to monitor soil quality for the concentrations of specified PTSs, often in relation to certain soil conditions, such as pH, soil type and content of organic matter and/or cation exchange capacity, in order that limit values are not exceeded.

c) sludge application rate, particularly:

- average quantity of PTSs that can be applied to the land and over what period, usually in terms of kg PTS/ha·y (or multiple of years), or mg PTS/kg nutrients;
- amount of sludge dry solids that can be applied per year or multiple of years;
- quantity of nutrients which can be applied in accordance with the content of soil and the need of crops grown;
- timing of and method of applying the sludge and after-use of the land and crops; these are generally designed to protect animals and food consumers from pathogen transfer, and/or conserve plant nutrients, and/or reduce the risk of run-off.

It is a general legal requirement for sewage sludge that appropriate records are maintained which in addition to the above criteria, should include information on sources and quantities applied and the location of the receiving land. However most countries do not yet require the same rigour for other sludges, even though they may have environmental effects similar to sewage sludge.

4.2.5 Strategic evaluation

In order to launch a sludge utilisation programme, a strategic exercise should be undertaken in order to evaluate its probable viability and sustainability within the area of land that is being considered for sludge recycling. This is particularly important where there has been no previous experience of using sludge, or when introducing a new sludge product.

A two phased approach should be adopted:

a) firstly, a comprehensive evaluation of the whole sludge strategy should be undertaken, employing BPEO methodologies. This would test the security, practicability environmental sustainability and economic viability of a proposed operation in an objective manner. Such evaluations would cover a wide range of factors that would probably include many of the following, which is neither exclusive nor in an order of priority:

- area of land that might be available;
- possibilities for temporary storage, if necessary;
- farming practices and other relevant land use information;
- use of alkaline amendment and fertilisers;

- what other "competitor" materials are available and their quality and quantity;
- national and local legislation and controls that would affect the operation of the proposed sludge use programme;
- reaction of farmers' organisations, the food industry and other stakeholders;
- management and organisation of the sludge production plant;
- sensitive zones (surface and ground water protection, housing, etc.);
- soil (type, quality, trafficability, nutrient status and pollutant content);
- sludge type, sludge quality, sludge quantity;
- climate, e.g. is there a rainy season when trafficability is low or a long frozen period when sludge application can be prohibited;
- topography, roads, bridges, etc. to evaluate access;
- consultation with a wide range of organisations to check the environmental and practical sustainability of the proposed sludge use programme;
- type of sludge that might be produced (e.g. liquid, dewatered, dried, composted, digested, limed, etc.) by varying the production or treatment process that is the most appropriate for a sustainable sludge use programme, bearing in mind the whole life cost of the alternatives;
- size, structure and location of storage facilities;
- some countries may require public consultation on the intention to start a sludge utilisation programme that involves advertising the intention and consulting with municipal administrations.

b) secondly, as an extension to a BPEO study, or as a separate exercise where sludge use programmes have been initiated or are ongoing, it is crucial to understand the potential customer base, its business needs, and how the proposed sludge use programme can satisfy these needs. This should be done using the whole marketing mix to test whether there is actually a market for the sludge.

4.2.6 Sludge quality

The preliminary stage should develop a methodology for controlling, monitoring, improving and maintaining sludge quality. The quality of sludge is crucial for its safe, beneficial and sustainable use, and for its suitability to be brought to the market". This invariably requires a rigorous source-control programme. A range of chemical, physical and microbiological quality criteria is important for compliance with legislation, for providing agronomic value, and for it to be aesthetically acceptable.

In the case of sewage sludge it is important to ascertain at the preliminary stage whether there is enabling legislation and an effective system for controlling discharges from factories to the sewerage system or whether such control at source can be implemented. A wide range of contaminants can be found in some sewage sludges due to discharges from industries, dwellings and surface drainage into sewers. Soil with an active microflora is capable of breaking down many organic compounds found in sludges. Experience has shown that, when sewage sludge has been used in compliance with the current controls over loading rate and use established in 86/278/EEC, no detrimental impact has been detected. For other sludges comparable systems should be designed to prevent excessive contamination from entering the sludges. Animal manures, food processing and abattoir sludges, and industrial residuals (e.g. paper, etc.) can contain significant concentrations of PTSs (and/or pathogens). The use of these materials on land should be taken into consideration when sewage sludge is applied in order to avoid over-application of PTSs and nutrients. It is important to recognise that agricultural land receives inputs of potentially harmful compounds from other sources, such as atmospheric deposition, traffic emissions, inorganic fertilisers and crop protection chemicals.

In regard to the microbiological qualities, it is not practicable to undertake frequent monitoring for specific pathogenic organisms because levels present can be extremely low and difficult to detect. As has been adopted for drinking water microbiology, some monitoring of suitable indicator organisms such as *E. coli* may be a preferable way of verifying that the overall processes of treatment and use meets specified hygienic requirements (see also CEN/TR 15809). Information about principles to be followed in different sludge treatment processes to reach specified hygienic requirements is given in CEN/TR 15809.

Some waterworks sludges may be beneficially applied to land to use their contents of organic matter and/or alkaline amendment, or even to modify soil texture. However there are some waterworks sludges that have negligible soil enhancement value. Waterworks sludges generally have a low content of N, P or K. These sludges result from the treatment of surface or ground waters. Their contents of PTSs and other contaminants are generally low. They are useful when soil improvement by the addition of organic matter or textural modification (e.g. adding silt to excessively drained coarse textured soils) or soil pH adjustment (by liming) are required but major plant nutrients are not needed.

4.2.7 Sludge type

Dewatering, drying, lime treatment, nutrient addition, composting and other processes may be beneficial to improve the properties of the sludge for its use in agriculture. Physically the material should be capable of easy storage and application. It should be treated to minimise the possibility of odour emission so that the public (particularly those local to where the sludge is applied) and the farmers' requirements are addressed. Sustainability may be enhanced by use of the appropriate treatment and application techniques.

4.2.8 Design of the sludge utilisation programme

Before commencing a sludge utilisation programme, the overall design, infrastructure, procedures and resourcing should be considered. Many of the components are discussed later in this document. They include the capacity, design and siting of storage facilities, with their relevant equipment (stirring, access, recovery, etc.), vehicles and their servicing, spreading equipment, labour, computer hardware and software. Locally prevailing regulations shall be complied with.

4.3 Quality control (including environmental and agronomic data)

4.3.1 Process control

Rigorous control at certain critical control points in the production and recycling process, backed up by the verification of independent audit contributes to ensuring the safety of sludge recycling and the confidence of important stakeholders. The critical control points and their critical values need to be identified and evaluated for each particular sludge processing and recycling example.

4.3.2 Sludge sampling and analysis

Sludges and sludge products should be sampled and analysed in order to:

— provide reliable information to customers;

— satisfy regulatory requirements;

— confirm that process controls are effective.

The frequency of sludge sampling and analysis should be appropriate to the size of the production plant and any anticipated fluctuation in quality. Plants producing large quantities of sludge, and plants where there is a variety of inputs and where varying quality is expected should be sampled more frequently. In general, sludge should be analysed at least every six months, based on composite samples derived from representative sub-samples.