SLOVENSKI STANDARD
SIST CR 13097:2001

01-december-2001

Karakterizacija blata - Dobra praksa za uporabo v kmetijstvu

Characterization of sludges - Good practice for utilisation in agriculture

Charakterisierung von Schlämmen - Gute Praxis bei der Verwendung von Schlämmen in der Landwirtschaft

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

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Ta slovenski standard je istoveten z: **CR 13097:2001**

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ICS:

13.030.20	Tekoči odpadki. Blato	Liquid wastes. Sludge
65.080	Gnojila	Fertilizers

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CEN REPORT

RAPPORT CEN

CEN BERICHT

CR 13097

August 2001

ICS

English version

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This CEN Report was approved by CEN on 9 June 2001. It has been drawn up by the Technical Committee CEN/TC 308.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document has been prepared by CEN /TC 308, "Characterisation of sludges".

This document is currently submitted to the BT for publication as a CEN Report.

The status of this document as CEN Report has been choosed because the most of its content is not completely in line with practice and regulations in each member state. This document gives recommendations for a good practice but existing national regulations concerning the sludge utilisation in agriculture remain in force.

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1 Scope

This CEN 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) ;

— water supply treatment plants ;

— but excluding hazardous sludges from industry.

Such sludges can be used on land as a source of plant nutrients, and/or soil improver, and/or liming material 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 and cost-effectiveness.

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

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

NOTE For evaluation and decisions for use of sludges, other documents are currently in development (see CR 13174).

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 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 report is read in the context of the conditions that prevail locally.

2 References

EN 1085, *Wastewater treatment – Vocabulary*.

EN 12832, *Characterisation of sludges – Utilisation and disposal of sludges – Vocabulary*.

CR 13174, *Characterisation of sludges - Sludge management in relation to use or disposal.*

CR 13846, *Characterisation of sludges – Recommendations to preserve and extend sludge utilisation and disposal routes.*

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3 Terms, definitions and abbreviated terms

For the purposes of this CEN Report, the following terms and definitions given in EN 1085, EN 12832 and EU Directive 86/278/EEC and the following apply.

3.1
potentially toxic element (PTE)
an inorganic substance which, when present in excess and in forms that are available to the subject in question, can be toxic

3.2
BPEO
Best Practicable Environmental Option

4 Requirements

4.1 General

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

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

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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 ;

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

d) have a long term secure future at minimum cost consistent with the above.

Considerations of treatment, source control of pollutants and preparation of sludges are discussed in CR 13174.

The widely recognised waste management hierarchy recommends that, in general, the use of sludge (e.g. by spreading on land within an environmental protection programme) as preferable to disposal options such as landfill. Where agricultural land is available and conveniently accessible, this is usually the Best Practicable Environmental Option (BPEO).

Sludges usually contain nutrients, organic matter and trace elements, which are beneficial to the growth of crops (including grass) and to the fertility, structure and/or texture of soils. They are 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 PTEs 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 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, and the need to demonstrate safety through quality assurance and independent validation.

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.

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This document has been written 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 will be 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.

4.2.2 National regulations

In the case of sewage sludge, national regulations set maximum permissible 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 environmental regulations may apply. Few if any 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 CEN Report CR 13846.

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4.2.3 Voluntary agreements

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In some states 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 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 for the concentrations of specified PTEs, and in some cases other contaminants such as persistent organics ;
- treatment of sludge to significantly reduce its content of pathogens and its fermentability (i.e. potential to produce bad odours) ;

b) soil quality, particularly :

- a soil sampling strategy to monitor soil quality for the concentrations of specified PTEs, 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 ;

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c) sludge application rate, particularly :

— the average quantity of PTEs that can be applied to the land and over what period, usually in terms of kg PTE/ha/y (or multiple of years), or mg PTE/kg nutrients ;

— the amount of sludge dry solids that can be applied per year or multiple of years ;

— the quantity of nutrients which can be applied, particularly nitrogen, and phosphorus in accordance with the types of crop grown ;

— the 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 :

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a) firstly, a comprehensive evaluation of the whole sludge strategy should be undertaken, employing Best Practicable Environmental Option (BPEO) methodologies. This would test the security, practicability 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 :

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— the area of land that might be available ;

— the possibilities for temporary storage, if necessary ;

— farming practices and other relevant land use information ;

— the use of lime 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 ;

— the reaction of farmers' organisations, the food industry and other stakeholders ;

— the 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 ;

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- consultation with a wide range or organisations to check the environmental and practical sustainability of the proposed sludge use programme ;

- the type of sludge that might be produced (e.g. liquid, dewatered, dry, compost, 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 ;

- the size, structure and location of storage facilities ;

- some countries may require public consultation on the intention to start a sludge utilisation programme that will involve advertising the intention and consulting with municipal administrations ;

b) secondly, as an extension to a best practicable environmental option (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 will actually be 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 and beneficial use, for its "marketability", and for the sustainability of sludge use programmes. This will invariably require 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.

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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 may 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. They include animal manures, food processing and abattoir sludges, industrial residuals (e.g. paper, etc.). They may contain significant concentrations of PTEs (and/or pathogens) but as most countries impose fewer controls on these materials than sewage sludge, the use of these materials on land should be taken into consideration when sewage sludge is applied to avoid over-application of PTEs 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, animal manures, inorganic fertilisers and crop protection chemicals.

Some waterworks sludges can be beneficially applied to land to use their contents of organic matter and/or lime, 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 PTEs 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.

In regard to the microbiological qualities, it is not practicable to undertake frequent monitoring for specific pathogenic organisms because levels present may 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 provides effective microbiological barriers. For sludges that present a hygiene hazard, it is desirable to identify an indicator organism (not necessarily pathogenic) that is naturally present in large numbers in the sludge and that has a susceptibility to treatment similar to the pathogens that are of concern. As an example, in the case of materials with faecal origin, *E. coli* has proved an effective indicator because it is always present in large numbers in untreated material and it has similar die-off characteristics to the pathogenic organisms (such as *Salmonella*) that are of concern.

An example of a quality control technique is outlined in Annex B.

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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 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 will 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. Consideration of these should take account of the locally prevailing regulations.

4.3 Quality control (including environmental and agronomic data)

4.3.1 Process control

As described in Annex B, rigorous control at certain critical control points in the production and recycling process, backed up by the verification of independent audit will ensure the safety of sludge recycling and the confidence of important stakeholders. The control points and their critical values need to be identified and evaluated for each particular sludge processing and recycling example.

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4.3.2 Sludge sampling and analysis

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

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— 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.

The method of sampling sludge should be evaluated carefully to ensure that the samples are representative of the quality of the sludge that is actually applied to land. This is particularly important for accurately measuring dry solids content, and the sludge should be well mixed prior to sampling.

The quality of certain industrial residuals for land spreading may vary substantially from batch to batch which should be taken into account in the sampling regime in order to ensure that representative samples are obtained.

The parameters that should be measured routinely in sewage sludge for compliance with regulations and to provide agronomic advice are :

— dry matter ;

— loss on ignition (which is used as an approximation of organic matter) ;

— pH ;

— total nitrogen ;

— total phosphorus ;