German DWA
Set of Rules

Advisory Guideline DWA-M 386E

Thermal Treatment of Sewage Slugde – Mono-Incineration

December 2011

Thermische Behandlung von Klärschlämmen – Monoverbrennung

German Association for Water, Wastewater and Waste
Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e. V.

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The German Association for Water, Wastewater and Waste (DWA) is strongly committed to the development of secure and sustainable water and waste management. As a politically and economically independent organisation it is professionally active in the field of water management, wastewater, waste and soil protection.

In Europe DWA is the association with the largest number of members within this field. Therefore it takes on a unique position in connection with professional competence regarding standardisation, professional training and information. The approximately 14,000 members represent specialists and executives from municipalities, universities, engineering offices, authorities and companies.

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Foreword

The DWA-Sub-Committee AK-3 “Energy-Related Reuse and Thermal Treatment” has dealt with special aspects of sewage sludge incineration in several working reports. Especially questions concerning emissions, as well as legal and economic aspects have been discussed in detail. The results have been published in the following technical reports in the DWA Journal *KA Abwasser Abfall*:

- “Klärschlammverbrennung – Emissionen (Sewage Sludge Incineration – Emissions)“ (ATV 1995)
- “NO_x- und N_2O-Emissionen bei der Verbrennung von Klärschlämmen (NO_x and N_2O Emissions Produced from Sludge Incineration)“ (ATV 1996)
- “Emissionen von Quecksilber aus Klärschlammverbrennungsanlagen (Mercury Emissions from Sludge Incineration Plants)“ (ATV 1997a)
- “Klärschlammverbrennung – Beseitigung oder Verwertung? (Sewage Sludge Incineration – Disposal or Reuse?)” (ATV 1997b)
- „Kostenstrukturen und Schnittstellen von Anlagen zur thermischen Klärschlammverwertung (Cost Structures and Interfaces at Treatment Plants for Thermal Sludge Reuse)“ (ATV-DVWK 2001)

In this Advisory Guideline, results presented in the working reports have been summarized and updated and important aspects in regard to mono-incineration of sewage sludge have been added.

Co-incineration of sewage sludge in power plants will be dealt with in a second Advisory Guideline DWA-M 387 “Thermal Treatment of Sewage Sludge – Co-Incineration in Power Plants”.

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This Advisory Guideline has been elaborated by the DWA-Sub-Committee AK-3 “Energy-Related Reuse and Thermal Treatment”.

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User Notes

This Advisory Guideline has been produced by a group of technical, scientific and economic experts, working in an honorary capacity and applying the rules and procedures of the DWA and the Standard DWA-A 400. Based on judicial precedent, there exists an actual presumption that this document is textually and technically correct.

Any party is free to make use of this Advisory Guideline. However, the application of its contents may also be made an obligation under the terms of legal or administrative regulations, or of a contract, or for some other legal reason.

This Advisory Guideline is an important, but not the sole, source of information for solutions to technical problems. Applying information given here does not relieve the user of responsibility for his own actions or for correctly applying this information in specific cases. This holds true in particular when it comes to respecting the margins laid down in this Advisory Guideline.

Introduction

The first plant for mono-incineration of sewage sludge was put into operation in Germany in 1975 in the city of Düren. By the year of 2010, 22 additional plants had been constructed for the incineration of municipal and industrial sewage sludges in Germany (see Chapter 14: Table 3). The total capacity of these plants amounts to approx. 800,000 t of sewage sludge (total solids, TS) per year with municipal sewage sludges making up about 500,000 t TS of the total amount (as of spring 2011). Thus, approx. 25 % of the 2.0 million t TS produced in Germany every year can be treated thermally in mono-incineration plants. These incineration plants mainly use fluidized-bed incinerators, more rarely multiple hearth furnaces, combination multiple hearth fluid bed furnaces, grate stoker furnaces, gasification or pyrolysis processes.

Except for Germany, mainly Belgium, the Netherlands, Great Britain, Austria and Switzerland use thermal treatment of sewage sludge in mono-incineration plants. Most incineration plants have been installed at municipal wastewater treatment plants. Others exist at chemical industry sites, power plants or as central incineration plants at other locations with adequate infrastructure. The plants make an important contribution to disposal safety and environmental protection. Energy produced during incineration is reused in most cases for the generation of steam and electricity and thus contributes to the power supply of the respective location.

1 Scope

This Advisory Guideline presents fundamental information for the technical realization and operation of plants for mono-incineration of sewage sludge. Furthermore, legal framework and aspects of economic efficiency shall be introduced.

For planners and operators of mono-incineration plants, this Advisory Guideline shall supply a basis

- for deciding on investments for the construction of new plants as well as
- for the determination of concepts and
- for the selection of a suitable process technology for given particular conditions.

The Advisory Guideline also supplies important information for machinery manufacturers and plant engineers. However, it does not give detailed dimensioning standards for a process engineering layout of the plant or parts of it.

Particular aspects of incineration of **industrial sewage sludges** (amongst others pollutant concentration, autoignition, mechanical characteristics) are manifold and will not be discussed in the Advisory Guideline.

This Advisory Guideline does not claim to represent all legal requirements and non-legislative rules and standards, which might apply in every individual case.

Thermal treatment of sewage sludge is in regard to quantity the most important disposal route in Germany. It is an important option for a safe, economically efficient and environmentally sound sludge disposal. Since the late 1980ies, the percentage of sludges which are treated thermally has risen from about 12 % to more than 50 %. Almost half of these sludge quantities are treated in mono-incineration plants. About the same amount is co-incinerated in coal power plants. Co-incineration is discussed in detail in the Advisory Guideline DWA-M 387 “Thermal Treatment of Sewage Sludge – Co-Incineration in Power Plants”.

The objective of the Advisory Guideline DWA-M 386 is to give fundamental information for the technical realization and operation of plants for mono-incineration of sewage sludge. Based on fuel characteristics of sewage sludge various incineration systems, possibilities for heat recovery and emission reductions as well as treatment options for flue gas purification are introduced. Furthermore, information on legal framework, on plant organisation and economic efficiency is presented. Finally, several practical examples of mono-incineration plants are discussed. For planners and operators of mono-incineration plants, this Advisory Guideline shall supply a basis for the determination about concepts during the planning phase and for decisions on investments for the construction of new plants. This Advisory Guideline also supplies important information for machinery manufacturers and plant engineers. However, it does not give detailed dimensioning standards for a process engineering layout of the plant or parts of it.

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