

German DWA Set of Rules

Advisory Guideline DWA-M 387E

Thermal Treatment of Sewage Sludge – Co-Incineration in Power Plants

May 2012

Thermische Behandlung von Klärschlämmen – Mitverbrennung in
Kraftwerken

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Publisher/Marketing:
German Association for Water, Wastewater and Waste
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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.

Imprint

Publisher and marketing:

DWA German Association for
Water, Wastewater and Waste
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53773 Hennef, Germany

Tel.: +49 2242 872-333

Fax: +49 2242 872-100

E-Mail: info@dwa.de

Internet: www.dwa.de

Translation:

Claudia Mayerl, Braunschweig

Printing (English version):

Bonner Universitäts-Buchdruckerei

ISBN:

978-3-942964-96-8

Printed on 100 % recycled paper

© DWA Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e. V., Hennef, Germany 2014
German Association for Water, Wastewater and Waste

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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 N₂O-Emissionen bei der Verbrennung von Klärschlämmen (NO_x and N₂O Emissions 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)

On the basis of these reports and in the context of the increasing importance of sludge disposal using co-incineration of sewage sludge in power plants, the sub-committee has developed the following Advisory Guideline.

Mono-incineration of sewage sludge is dealt with in a second Advisory Guideline DWA-M 386 "Thermal Treatment of Sewage Sludge – Mono-Incineration".

Former editions:

No precursor documents

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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

Thermal treatment of sewage sludge is an important disposal option in Germany. Since the late 1980ies the percentage of sludges, which are treated thermally, has increased from ca. 12 % to more than 50 % in the year 2009. Between the late 1990ies and the year 2006, above all co-incineration capacities in power plants for about 650,000 t total solids (TS) have been established. While co-incineration of sewage sludge in power plants was quantitatively of no importance in 1996, about 25 % of all sewage sludges produced in Germany were disposed of using co-incineration in 2009. Total sludge quantity produced in 2009 amounted to about 2.0 million t TS according to the *Statistische Bundesamt* (Federal Statistical Office). Thus in 2009 about the same quantities of sewage sludge have been incinerated in power plants as have been treated thermally in mono-incineration plants. Besides co-incineration in power plants, significantly smaller amounts have been co-incinerated in cement plants and in waste incineration plants (ca. 2 % to 4 % each). (STATISTISCHES BUNDESAMT 1991, 2008, 2010, LEHRMANN 2009).

Related to the mass flow of unprocessed coal up to 5 % dry sludge solids can be co-incinerated in black coal-fired power plants and up to 10 % of dry sludge solids in brown coal-fired power plants. Combustion systems used are mainly dry-bottom pulverized coal firing or fluidized bed firing. By substituting fossil fuels, an important contribution to climate protection and resource conservation is made.

1 Scope

This Advisory Guideline presents fundamental recommendations and information for the technical realization and operation of plants for co-incineration of sewage sludge. Furthermore, legal framework and aspects of economic efficiency shall be introduced. For planners and operators of co-incineration plants, this Advisory Guideline shall supply a basis for deciding on investments for the construction of new plants as well as a guideline for the operation of such plants.

This Advisory Guideline does not focus on co-incineration in industrial combustion plants (e. g. cement plants), since only comparably small sludge quantities are disposed of in these plants. In addition, the discussion of this wide variety of process technologies would go beyond the scope of this Advisory Guideline.

This Advisory Guideline does not give detailed dimensioning standards for a process engineering layout of a plant or parts of it and does not claim to represent all legal requirements and non-legislative rules and standards, which might apply in every individual case.

PREVIEW

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 %. Especially co-incineration of sludges in coal power plants has increased strongly over the last years. About 25 % of all sewage sludges produced in Germany are disposed of using co-incineration in coal power plants. Thus the share of co-incineration in overall sludge disposal is about the same as that of mono-incineration. Mono-incineration is discussed in detail in the Advisory Guideline DWA-M 386 "Thermal Treatment of Sewage Sludge – Mono-Incineration".

The objective of the Advisory Guideline DWA-M 387 is to give fundamental information for the technical realisation and operation of plants for the co-incineration of sewage sludges in coal power plants. Based on fuel characteristics of sewage sludge, the effects of co-incineration on various firing systems for brown and black coal, on flue gas purification and on incineration residues are dealt with in detail. Furthermore, information on legal framework and economic efficiency is presented. Finally, several practical examples of co-incineration plants are discussed. For planners and operators of co-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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ISBN 978-3-942964-96-8

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