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Standard DWA-A 216E

Energy Check and Energy Analysis – Instruments to Optimise the Energy Usage of Wastewater Systems

December 2015

Energiecheck und Energieanalyse –
Instrumente zur Energieoptimierung von Abwasseranlagen
Dezember 2015

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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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Editor's Note on the English Translation

The energetic optimisation of wastewater systems has been a central issue in Germany since the 1990s. At that time, among other things, the handbook "Energie in Kläranlagen – Handbuch" (MURL 1999) was published by the state of North Rhine-Westphalia. This handbook described the procedure for the preparation of energy checks and energy analysis for wastewater treatment plants for the first time. In Germany, this was followed by a more than a decade-long specialist discussion on how the energetic situation of municipal wastewater treatment plants should be appropriately assessed. The central result of this dispute is the insight that the energetic situation of a specific wastewater system cannot be appropriately assessed either through the comparison with fixed key indicators (e.g. the annual electricity consumption per connected total number of inhabitants and population equivalents) or on the basis of statistical average values of other wastewater systems, as the individual boundary conditions of the wastewater systems vary too much.

Against this background, a new procedure was established in 2015 with the Standard DWA-A 216 "*Energy Check and Energy Analysis – Instruments to Optimise the Energy Usage of Wastewater Systems*". According to this, the assessment of the energetic situation of a wastewater treatment plant is based on the comparison of the as-is status with the **plant-specific ideal value which the considered wastewater treatment plant** is able to achieve. Only this comprehensive approach in the context of an energy analysis makes it possible to appropriately capture the actual potentials for the energetic optimisation at the respective plant and to develop meaningful measures to improve the energetic situation. For an initial orienting assessment of the energetic situation of a wastewater treatment system, the Standard DWA-A 216 offers the additional instrument of the energy check.

The present English version of the Standard DWA-A 216E is an unaltered translation of the original German text and therefore also contains information that applies specifically to the situation in Germany.

The technical concept of the Standard DWA-A 216 is also described in the "Guidelines – Energy Efficiency in Water and Wastewater Utilities" (11/2015), which were developed within the framework of a project funded by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and published by the Arab Countries Water Utilities Association (ACWUA 2015).

Foreword

Fully functional wastewater systems are a basic requirement for intact water bodies and represent indispensable infrastructure facilities for a modern state. Energy is required by urban drainage systems to fulfil this important task. Wastewater treatment plants are among the main power consuming units of municipalities. There are about 10.000 wastewater treatment plants in Germany and their total energy consumption is in a magnitude of 4.200 gigawatt-hours (GWh) per year (DWA 2010). This is roughly equivalent to the energy demand of 900.000 four-person households or – expressed in CO_2 equivalents – an emission in the order of 2,36[1] million tonnes per year (with 562 g $CO_{2,e}$/kWh according to UBA (2014)). The energy demand of wastewater treatment plants not only depends on the cleaning process and the cleaning objective but also on the local boundary conditions and energy efficiency achieved.

The demand for energy is rising worldwide, the finite nature of fossil resources, increasing energy costs and concern about impact on the climate demands a major change in the energy supply and energy use – this also applies to the field of urban drainage.

Due to the local concentration of energy intensive plant components and the simultaneous generation of a source of energy and the generation of electrical and thermal energy, urban drainage offers numerous possibilities for reducing energy demand and increasing energy efficiency.

In doing so, these efforts to improve the energy efficiency should not contravene the primary purpose of urban drainage, that is discharge and treatment of wastewater with the objective of protecting the waterbodies.

Energy analysis, investigations by the German Federal Environmental Agency (HABERKERN et al. 2008) and the DWA (DWA 2010) as well as the "Benchmarking Abwasser NRW (KOMMUNAL- UND ABWASSERBERATUNG NRW 2011)) clearly show the potentials to increase the energy efficiency of wastewater systems. Optimisation of energy efficiency not only offers both energy-related and economic benefits but often goes hand in hand with an improvement in the cleaning performance of the wastewater systems and thus improves water pollution control.

Considering the complexity of the processes within the wastewater disposal, a systematic approach and extensive expertise with regard to the energy optimisation of wastewater systems is essential. So far there is no consistent and uniform methodology for evaluation of the energy efficiency of wastewater systems throughout Germany.

The present Standard introduces an energy check and energy analysis as tools for the energy optimisation of wastewater systems and covers the requirements stipulated for using these methods.

For reasons of a concise and reader friendly text in this Standard generally the male form is set for personalised professional job titles and function designations. All information applies to both genders.

Former editions

No former document

1) Editor's note: In Standard DWA-A 216E a comma is used as decimal marker.

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User Notes

This Standard 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 and also generally recognised.

Any party is free to make use of this Standard. 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 Standard 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 Standard.

1 Scope

This Standard provides a practice-based working instrument related to process engineering and energy optimisation of wastewater systems for planners, operators and competent authorities.

The area of application of this Standard covers facilities for wastewater treatment and wastewater discharge.

The energetic assessment of pumping stations on the basis of the approaches introduced in this Standard in the field of wastewater collection should be made in the same way as for pumping stations in wastewater treatment plants. Currently, there is no sufficient systematically collected data on operational experience in the field of rainwater- and combined sewer treatment plants (e.g. retention soil filter etc.). Same applies for compressed air flow, pneumatic conveyance as well as vacuum-drainage and pressure drainage.

Basically this system is also transferable to wastewater treatment plants in the industrial sector. The difference between industrial and municipal wastewater treatment plants is found in the former´s particular load situation and the their specifically optimised cleaning processes.

The approach to refer the energy consumption to the connected total number of inhabitants and population equivalents chosen in this Standard is similar to the applied system of indicators used in benchmarking (see AGIS 2002). According to this, the collected data can easily be used in benchmarking. In addition to the comparison of key figures therein, additional technical calculations are provided within the energy analysis which are helpful with regard to the development and the assessment of measures in particular. In this sense, the energy analysis constitutes a supplement for the development of action alternatives.