BS ISO 21939-2:2023

BSI Standards Publication

Method to calculate and express energy consumption of industrial wastewater treatment for the purpose of water reuse

Part 2: Accounting for energy recovery

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee B/505/50, Water reuse.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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Published by BSI Standards Limited 2024

ISBN 978 0 539 12397 5

ICS 13.060.01; 13.060.30

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 29 February 2024.

Amendments/corrigenda issued since publication

Date	Text affected

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International Standard

ISO 21939-2

First edition
2023-12

Method to calculate and express energy consumption of industrial wastewater treatment for the purpose of water reuse —

Part 2:
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Reference number
ISO 21939-2:2023(en)

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Foreword

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This document was prepared by Technical Committee ISO/TC 282, *Water reuse*, Subcommittee SC 4, *Industrial water reuse*.

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Introduction

Anaerobic treatment is a common part of industrial wastewater treatment, for example in the food industry. It is also commonly used in municipal wastewater systems as sludge stabilization, for example anaerobic digester (AD). Anaerobic digestion is a sequence of processes by which microorganisms break down biodegradable material in the absence of oxygen.

Anaerobic digestion is widely used as a source of renewable energy. The anaerobic digestion process has two main products: digested sludge and biogas, consisting of methane, carbon dioxide and traces of other contaminant gases.

The anaerobic treatment can be analysed for its energy consumption, like any other treatment process, using ISO 21939-1.[1] The energy consumption in AD is mainly used for mixing and heating systems.

However, anaerobic treatment also produces a potential energy resource, namely biogas, that can offset some or all of its energy consumption and in some cases end up energy positive. The excess energy can be utilized to produce electricity for other systems in the treatment plant, as indicated in ISO 21939-1,[1] such as aeration in aerobic processes, which can be the greatest consumers of energy in the plant.

In biological wastewater treatment, such as activated sludge treatment, a lot of energy is consumed for aeration systems such as blowers and aerators, which are needed to supply oxygen and mixing for the aerobic process.

To expand ISO 21939-1,[1] it is beneficial to account for the energy recovered and the net energy consumption as a basis for evaluation and comparison of biological treatment processes for reuse. It is also important to design and operate efficiency processes to produce and recover the highest amount of energy in order to use it as a source for the anaerobic digestion process and other uses, on site or outside the wastewater plant.

This document relies on the following concepts:

— Energy recovery is an operation encouraged in industrial wastewater treatment for reuse, mainly due to its net energy efficiency, which becomes significant and relevant with high concentrations of organic matter.

— One of the common ways to recover energy from industrial wastewater treatment is by using anaerobic digestion.

— The anaerobic digestion wastewater treatment is characterized by low energy consumption, as well as generation of biogas with a high calorific value.

— The biogas is often used as an energy source for generation of heat or electricity or a combination of both (combined heat and power generation).

— In addition, treated wastewater at high temperature is sometimes used for heating.

This document complements ISO 21939-1,[1] in which the energy consumption for the wastewater treatment process is quantified. Its purposes are:

— to account for energy production, where applicable, in order to obtain a net high energy value;

— to review different conditions and their influence on the biogas and methane yield;

— to outline possible uses of the biogas which have different actual energy production values;

— to define general principles for quantification and accounting for energy recovered and provide guidance on how to integrate these values with the energy consumption of ISO 21939-1;[1]

— to provide general guideline for efficient reuse of biogas for the consumption of relevant systems in industrial wastewater treatment plants, as discussed in ISO 21939-1.[1]

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