

**INTERNATIONAL  
STANDARD**

**ISO  
23043**

First edition  
2021-03

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**Evaluation methods for industrial  
wastewater treatment reuse processes**



Reference number  
ISO 23043:2021(E)

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Published in Switzerland

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

Reuse of industrial wastewater is an important strategy for reducing freshwater consumption and wastewater generation. Treated industrial wastewater can be used for various purposes [6,10,14]. The dominant industrial applications are cooling water for power generation, boiler feed water, equipment cleaning and general process water uses. Reused water may also be applied for non-industrial applications most typically including toilet and urinal flushing, and landscape irrigation [9,13,14].

Currently, various methods are applied to evaluate the resource use, energy and environmental performance respectively, which can be also used in industrial systems, including Life Cycle Assessment (ISO 14040), Environmental Risk Assessment (IEC 31010), Best Available Technology (Directive 2010/75/EU), Ecological Footprint (ISO 14046), Circular Economy (BS 8001) and other methods [1,2,16,17]. The primary evaluation criteria selection for industrial wastewater treatment reuse processes has historically been based on a cost-benefit analysis, however, economic factors are no longer the main decision factor, nowadays, industries take into consideration a number of sustainable factors, including economics, environment, social and technology characteristics [2,7,9,10,15-18].

The evaluation of wastewater treatment reuse processes requires systematic methods to evaluate the performance expectations of alternative wastewater treatment reuse processes [2,10,18].

This document provides guidelines for assessing wastewater treatment reuse processes through enhanced information analysis, to ensure protection of environmental and human health, to promote the transition of the circular economy and improve water management.



# Evaluation methods for industrial wastewater treatment reuse processes

## 1 Scope

This document specifies the principles and framework for comprehensive evaluation of industrial wastewater treatment reuse processes, including:

- a) establishing goals and scope;
- b) illustrating the evaluation procedure; and
- c) determination of evaluation indicators (technology indicator/sub-indicators, environment indicator/sub-indicators, resource indicator/sub-indicators, economy indicator/sub-indicators).

This document describes how to comprehensively evaluate industrial wastewater treatment reuse processes using the proposed calculation approaches and recommended indicators. It does not specify methodologies for single evaluation indicators.

The document is intended to provide assistance to a broad range of industrial wastewater treatment and reuse project stakeholders including professionals (planning, management, designers, and operators), administrative agencies (monitoring, assessment, regulation and administration) and local authorities.

This document is applicable to

- a) evaluating comparing and selecting industrial wastewater treatment reuse processes,
- b) implementing continuous improvements,
- c) upgrading processes and improving performance for existing treatment and reuse facilities.

The intended application of the comprehensive evaluation result is considered within the goal and scope definition.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 20670, *Water reuse — Vocabulary*

## 3 Terms, definitions and abbreviated terms

### 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20670 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>