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Guidelines for performance evaluation of treatment technologies for water reuse systems —

Part 8: Evaluation of treatment systems based on life cycle cost

Lignes directrices pour l'évaluation des performances des techniques de traitement des systèmes de réutilisation de l'eau —

Partie 8: Évaluation des systèmes de traitement fondée sur le coût global

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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).

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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.

This document was prepared by Technical Committee ISO/TC 282, *Water reuse*, Subcommittee SC 3, *Risk and performance evaluation of water reuse systems*.

A list of all parts in the ISO 20468 series can be found on the ISO website.

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.

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Introduction

The purpose of this document is to more specifically define a methodology for evaluating the economic performance of treatment systems, which is covered in ISO 20468-1:2018, Clause 7. The background to this document is the need to promote water reuse projects with cost-effective treatment systems in communities and industrial facilities in order to achieve sustainable water supply. A variety of stakeholders, including managers of water reuse projects and owners of water infrastructure and facilities, can select appropriate treatment systems through comprehensive performance evaluations using this document and the ISO 20468 series.

The concept of the economic performance evaluation methodology has already been established based on life-cycle cost (LCC), comprising capital, operation and maintenance (O&M), and disposal costs in IEC 60300-3-3. The economic performance evaluation methodologies of the petroleum and natural gas industries and building and constructed assets are defined in ISO 15663 and ISO 15686-5, respectively, based on the general standard of IEC 60300-3-3. The importance of the economic evaluation, based on LCC considering the environmental impact, is also described in guidelines for selecting high-quality water infrastructure and facilities.[14] With reference to these existing standards, this document provides a customized evaluation methodology for treatment systems in water reuse projects based on LCC, taking environmental impact into consideration. In this document there are no restrictions on applicable treatment systems, such as biological, physical or membrane separation.

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Guidelines for performance evaluation of treatment technologies for water reuse systems —

Part 8:
Evaluation of treatment systems based on life cycle cost

1 Scope

This document provides life-cycle cost (LCC) methodology for treatment systems for water reuse for initial planning as well as later performance evaluation. LCC analysis provides valid information to determine whether the objectives have actually been accomplished and how operations are improved and optimized. Environmental impact is also taken into account in the LCC evaluation.

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, symbols and abbreviated terms

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

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 Terms and definitions

3.1.1
capital cost
money used to purchase, install and commission a capital asset

3.1.2
disposal cost
money used to demolish and rehabilitate a capital asset at the end of its life

3.1.3
operation and maintenance cost
cost incurred in running and managing the facility, labour, material and other related costs incurred to retain a building or its part in a state in which it can perform its required functions

3.1.4
life-cycle cost
total cost incurred during the life cycle

[SOURCE: IEC 60300-3-3:2017, 3.1.13]

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3.1.5
life-cycle costing
process of evaluating the difference between the life-cycle costs of two or more alternative options

[SOURCE: ISO 15663:2021, 3.1.27, modified — Note to entry removed.]

3.2 Symbols and abbreviated terms

For the purposes of this document, the following symbols and abbreviated terms apply:

C	LCC, LCY/year
C_{a}	LCC of alternative system, LCY/year
C_{b}	LCC of baseline system, LCY/year
C_{d}	disposal cost, LCY/year
C_{i}	capital cost, LCY/year
C_{o}	operation and maintenance cost, LCY/year
$C_{\mathrm{o(w)}}$	cost for water input or water output in O&M, LCY/year
ΔC	cost reduction in water use, LCY/year
η_{h}	heat output recovery ratio
η_{w}	water recovery ratio
LCC	life-cycle cost
LCY	local currency
O&M	operation and maintenance
Q_{outa}	heat output in alternative system, J/year
Q_{outb}	heat output in baseline system, J/year
u	unit cost, LCY/m^3
w	water consumed, m^3/year
W_{ina}	water input in alternative system, m^3/year
W_{inb}	water input in baseline system, m^3/year
W_{outa}	water output in alternative system, m^3/year
W_{outb}	water output in baseline system, m^3/year

4 Concept of economic evaluation

4.1 General

The concept of life-cycle costing is applied to evaluate the economic performance of treatment systems in a water reuse project. An economic evaluation procedure using the total cost of the treatment system throughout a project's life can be applied to estimate the cost difference between each alternative system to select an appropriate water reclamation technology, while satisfying the project's requirements.

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