

INTERNATIONAL
STANDARD

ISO
22447

First edition
2019-11

Industrial wastewater classification

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Reference number
ISO 22447:2019(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).

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).

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.

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.

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Introduction

Industrial wastewater is produced by many kinds of industries. In some parts of the world, climate change is putting water resources under stress. Treatment of industrial wastewater provides an opportunity for resource recovery, which can help to drought-proof ongoing operations. Reclaiming and reusing industrial wastewater reduces demands on limited freshwater resources, as well as the amount of wastewater and the associated contaminants that are released to the environment. How to process and reuse industrial wastewater efficiently is a great challenge as wastewater characteristics are as complex and varied as the industries that produce these waste-streams. Industrial wastewater contains a wide range of inorganic and complex organic contaminants, with various concentrations and almost as wide a range of potential physical, chemical and biological treatment processes and has specific treated water quality required for reuse. A clear ISO industrial wastewater classification and coding system is needed to assist both industry and government to record the information of wastewater (including industrial type and water quality parameter) and provide some information on identifying best available control technologies and treatment performance capabilities in order to establish reasonable expectations and facilitate the development of universal wastewater treatment technologies in industrial reuse, and promote the information communication during commercial trade, for example, bidding, consultation, and so on.

The industrial wastewater classification system described in this document covers the basic and most important information required to properly characterize industrial process waste-streams to quickly determine the requirement of the appropriate treatment or reuse technology options for specific industries, reduce operating costs for enterprises, and ultimately promote the systematic development of process water treatment and reuse technologies for industrial application. For the government and large corporations, a more important usage of the classification and coding system is to help them with establishment and improvement of standards concerning discharge and reuse of industrial wastewater.

This document provides a wastewater classification framework and coding system, along with a water quality parameter list. The usages of the classification and coding system facing different users, namely the entrepreneur or the government, are provided in [Annex A](#). It is intended that this classification system will help to promote understanding between different business parties, governments, to collaboratively develop wastewater treatment and reuse technologies among different countries, improve the efficiency of industrial wastewater reuse, and save and protect environment. Due to the similar nature, it may also apply for the wastewater treatment concerning discharge.

Industrial wastewater classification

1 Scope

This document specifies the principles, categories, and codes for the classification of industrial wastewater and is applicable to all types and sources of industrial wastewater. It provides a broad framework classifying industrial wastewater into different categories based on industry type and the associated water quality constituents, namely physical, chemical and biological characteristics with a specific code assigned based on both industry type and waste-stream classification.

2 Normative references

There are no normative references in this document.

3 Terms, definitions and abbreviated terms

For the purposes of this document, the following terms and definitions apply.

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

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

3.1 Terms and definitions

3.1.1

biochemical oxygen demand

BOD
mass concentration of dissolved oxygen consumed under specified conditions by the aerobic biological oxidation of a chemical compound or organic matter in water

Note 1 to entry: BOD₅: Degradation time = 5 days; Temperature = 20 °C.

[SOURCE: ISO 9408:1999]

3.1.2

chemical oxygen demand COD

mass concentration of oxygen equivalent to the amount of dichromate consumed by dissolved and suspended matter when a water sample is treated with that oxidant under defined conditions

[SOURCE: ISO 6107-2:2006]

3.1.3

EC₅₀

concentration estimated to cause an effect on a test end-point in 50 % of an exposed population over a defined exposed period

[SOURCE: ISO 16387:2014]

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3.1.4

free chlorine

chlorine present in the form of hypochlorous acid, hypochlorite ions or dissolved elemental chlorine

[SOURCE: ISO 7027:1999]

3.1.5

total coliforms

group of aerobic and facultatively anaerobic Gram-negative, non-spore-forming, lactose-fermenting bacteria which typically inhabit the large intestine of man and animals

[SOURCE: ISO 6107-7:2006]

3.1.6

total dissolved solids (TDS)

weight of inorganic and organic matter in true solution per unit volume of water

[SOURCE: ISO 16345:2014]

3.1.7

total hardness

total concentration of calcium and magnesium

[SOURCE: ISO 6059:1984]

3.1.8

total kjeldahl nitrogen

TKN

concentration of organic nitrogen and ammoniacal nitrogen in a sample, determined under specified conditions based on digestion with sulfuric acid

[SOURCE: ISO 6107-8:1993]

3.1.9

total nitrogen

sum of *total kjeldahl nitrogen* ([3.1.8](#)) (ammonia, organic and reduced nitrogen) and nitrate-nitrite

3.1.10

total organic carbon

TOC

all the carbon present in organic matter which is dissolved and suspended in the water

[SOURCE: ISO 11733:2004]

3.1.11

total phosphorus

sum of all phosphorus compounds that occur in various forms

3.1.12

total residual chlorine

chlorine present in the form of *free chlorine* ([3.1.4](#)) or combined chlorine, or both

[SOURCE: ISO 7027:1999]

3.1.13

total solids

TS

sum of dissolved and suspended solids

[SOURCE: ISO 6107-2:2006]

3.1.14**total suspended solids****TSS**

weight of particulates, both organic and inorganic, suspended, but not dissolved, per unit of water

[SOURCE: ISO 16345:2014]

3.1.15**turbidity**

reduction of transparency of a liquid caused by the presence of undissolved matter

[SOURCE: ISO 7027:1999]

3.1.16**96 h LC₅₀**

bioassay determining the dilution of an effluent which causes the death of 50 % (one half) of a group of test animals (typically rainbow trout) after exposure for 96 hours

3.2 Abbreviated terms

BOD₅ biochemical oxygen demand after 5 days

COD chemical oxygen demand

DO dissolved oxygen

EC electrical conductivity

FOG fat, oil and grease

n.e.c. not elsewhere classified

SDI silting density index

TDS total dissolved solids

TKN total Kjeldahl nitrogen

TN total nitrogen

TOC total organic carbon

TOD total oxygen demand

TP total phosphorus

TS total solids

TSS total suspended solids

4 Classification of industrial wastewater**4.1 Classification principle and code structure for industrial wastewater classification****4.1.1 Classification principle**

Industrial processes, even in the same industry (e.g. pulp and paper), characteristically generate different distinctive waste-streams as a result of differences between production processes.

Consequently, the effectiveness of a particular technology or a group of technologies can be expected to be varied, and require different wastewater treatment processes and reuse technologies.

In this document, hierarchical classification is used to classify different levels of industrial wastewater based on: type of the industry (Level 1) and water quality parameters (e.g. pH, TSS, TDS, COD, TN and TP) (Level 2). The relationship between different levels is shown in [Figure 1](#). Level 1 and Level 2 have a progressive relationship.

This classification system defines the basic and most important characteristics of industrial wastewater from different dimensions. It is intended to guide technology selection and design for industrial wastewater treatment and reuse. Although some reference codes are provided in this document, the relevant and suitable parameters can be selected according to local industrial wastewater quality and technological conditions in different countries or regions.

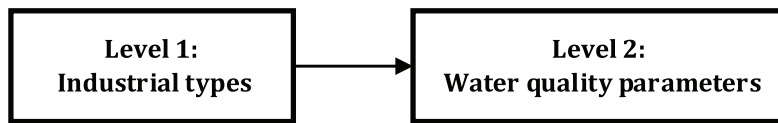


Figure 1 — Relationship between different levels of industrial wastewater classification

4.1.2 Code structure

The code of industrial wastewater classification adopts hierarchical code. The hierarchy corresponding to the classification of industrial wastewater is divided into two levels. The hierarchical code of each level is in an ascending order.

The hierarchy code structure of industrial wastewater classification contains two levels ([Figure 2](#)). Level 1 (the first two digits) indicates the classification according to industry types, which uses two letters following the alphabetic order for each letter (from A to Z, then from a to z, which is 52 codes for each digit). Level 2 (the number of digits is determined by the number of water quality parameters included; each parameter has a four-digit-code) indicates the classification according to the water quality of the industrial wastewater. A hyphen is used for distinguishing between each water quality parameter.

For Level 2, if some water quality indexes are irrelevant to the certain industrial type, the corresponding codes should not be included. However, if it is still necessary for considering the requirements or the effects of those water quality indexes with no available value, the value of the parameter should be set as 0a as a default value.

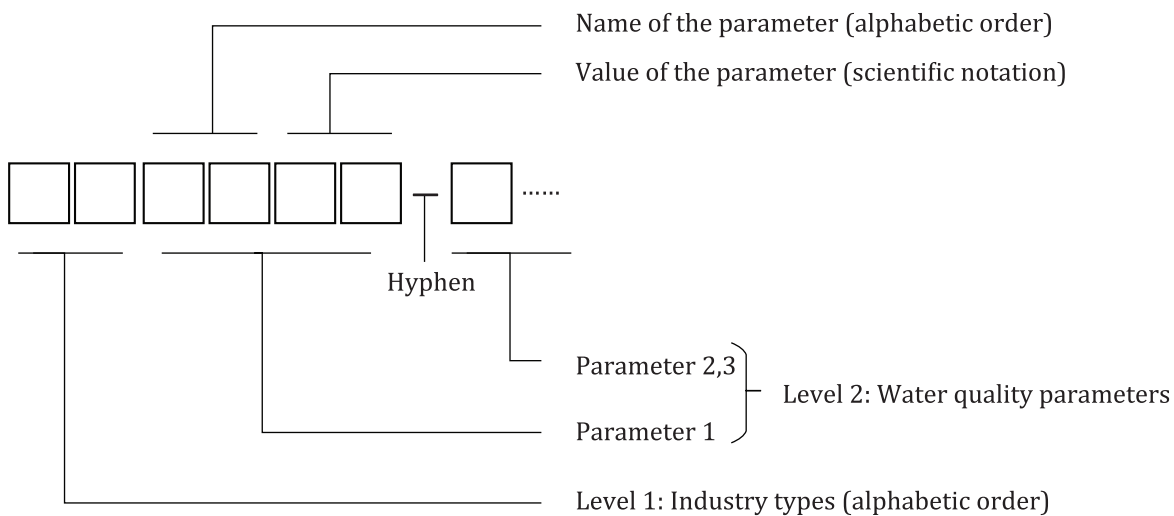


Figure 2 — Code structure of industrial wastewater classification