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Marine technology — Seawater desalination — Vocabulary

Navires et technologie maritime — Dessalement de l'eau de mer — Terminologie

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Contents

Page

Foreword

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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.

Introduction

Establishing a standardized set of terms and definitions is highly important for the production of scientific and engineering publications in a technical area, including the development of standards. The absence of a standardized terminology can ultimately result in inefficiencies and a high-probability of misinterpretation.

This document defines terms and definitions used in the entire process of seawater desalination. The flow process of seawater desalination is given in Figure 1. Desalination methods are mainly categorized into distillation processes and membrane processes. Both processes involve mutual parts of water intake, pre-treatment and post-treatment, but differ in terms of membrane desalination and distillation desalination. In addition, the auxiliary terms consisting of membrane cleaning and agents dosing are essential for specific processes.

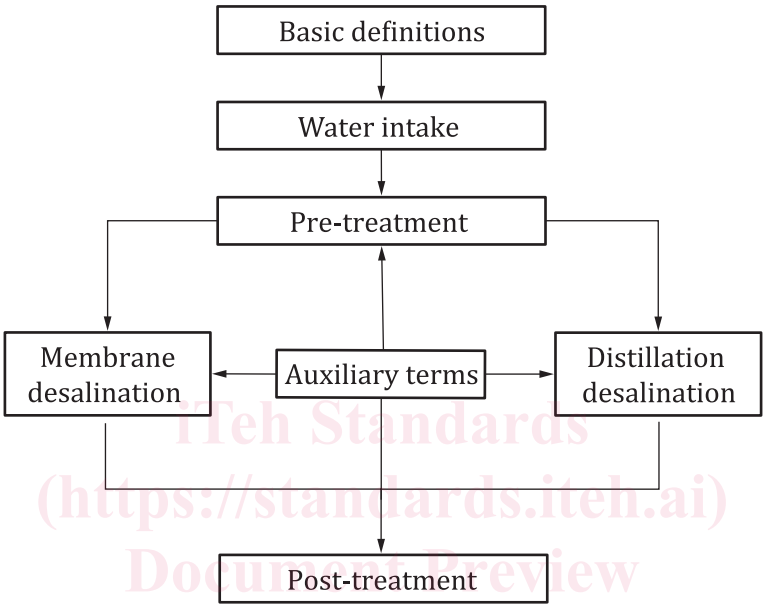

Figure 1 — Flow diagram of seawater desalination terminology

This document aims to provide guidance for unified terminology in seawater desalination; remove any obstacles to communication in management, industry and academia; and promote multi-field cooperation in more countries and regions. The objective of this document is to consolidate unified descriptions of seawater desalination activities, for the benefit of all users and stakeholders.

Marine technology — Seawater desalination — Vocabulary

1 Scope

This document defines terms and definitions for the integral seawater desalination process. It covers basic definitions, as well as specific subject matter including water intake, pre-treatment, membrane desalination, distillation desalination, post-treatment and auxiliary terms.

This document applies to all types and sizes of seawater desalination facilities and systems, and to all types of stakeholders involved in seawater desalination.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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 Basic definitions

3.1.1
seawater desalination
process which removes excess substances such as organisms and salts from seawater to make it usable as municipal water, industrial water and for other applications

3.1.2
seawater desalination system
set of interrelated or interacting units for *seawater desalination* (3.1.1) processes, including source *water intake* (3.2.1) system, *pre-treatment* (3.3.1) facilities, membrane and distillation separation devices, post-treatment facilities and electronic control unit, etc.

3.1.3
source water
raw water
inlet water supplied to the *seawater desalination system* (3.1.2)

3.1.4
feed water
inlet water supplied to an individual component or a device of *seawater desalination system* (3.1.2)

3.1.5
desalinated water
freshwater produced by distillation and membrane desalination plants

3.1.6
product water
water produced by *post-treatment* (3.6.3) of *desalinated water* (3.1.5) such as *mineralization* (3.6.4) and *waters blending* (3.6.5)

3.1.7
brine
concentrate (reject) stream from a membrane or a distillation device performing desalination, with a salinity that is higher than seawater

3.1.8
concentration factor
CF
ratio of the concentration of components in the retentate [concentrate, *brine* (3.1.7)] to the concentration of the total components in the feed

Note 1 to entry: Concentration factor (CF) is generally expressed by C_b/C_f, where C_b is brinewater concentration and C_f is feedwater concentration.

3.1.9
recovery rate
ratio of the permeate volume to the feed volume

[SOURCE: ISO 23070:2020, 3.10]

3.1.10
element
component containing the membrane, generally replaceable, such as hollow fibre, spiral wound cartridge or cassette

[SOURCE: ASTM D6161-2019, 5.1, modified — "hollow fibre" has been added to the definition.]

3.1.11
module
membrane *element* (3.1.10) combined with the element's housing

Note 1 to entry: The *pressure vessel* (3.4.3) contains the membrane element(s).

[SOURCE: ASTM D6161-2019, 5.1, modified — part of the original definition has been moved to Note 1 to entry.]

3.2 Water intake

3.2.1
water intake
process of withdrawing seawater from the source

3.2.2
surface intake
seawater collected from the open ocean above the seabed

Note 1 to entry: Surface intakes can be single purpose or collocated with a power plant as well as offshore submerged, nearshore submerged, or nearshore surface intakes.

3.2.3
subsurface intake
seawater collected via *vertical wells* (3.2.3.1), infiltration galleries or other locations beneath the seabed

Note 1 to entry: Subsurface intakes can be onshore (vertical wells), including vertical beach wells or deep aquifer wells, horizontal wells, radial or collector wells, and beach infiltration galleries; or offshore wells, including horizontal drains (wells), and seabed infiltration galleries.

3.2.3.1
vertical well
well which is well-drilled straight down into the underlying rock or unconsolidated coastal aquifer system

3.2.3.2
slant well
well which is well-drilled at an angle from the horizontal into the underlying rock or unconsolidated coastal aquifer system

3.2.3.3
infiltration gallery
filtering device which is a horizontal drain made from open jointed or perforated pipes, or a blocked drain, which is laid below the water table and collects seawater

3.2.3.4
tunnelled intake
seawater collected from deep water by the tunnelled structure

Note 1 to entry: The tunnel is built over the full distance from the intake structure to the diffusers offshore.

3.3 Pre-treatment

3.3.1
pre-treatment
processes such as chlorination, filtration, coagulation, clarification, dechlorination, which may be used on *feed water* (3.1.4) ahead at *reverse osmosis* (3.4.2) membrane devices and distillation devices to minimize *scaling* (3.6.2) and blockage potential and to control biological activity

3.3.2
sterilization
process which inactivates or removes all living organisms (including vegetative and spore forms) as well as viruses

[SOURCE: ISO 6107:2021, 3.539]

3.3.3
dissolved air flotation
DAF
flotation process by which low density particles are removed from seawater by using fine bubbles which are produced by the reduction in pressure of a water stream saturated with air

[SOURCE: ISO 20480-4:2021, 3.2, modified — Note 1 to entry has been removed.]

3.3.4
flocculation
formation of large separable particles by aggregation of small particles; the process is usually assisted by mechanical, physical, chemical or biological means

[SOURCE: ISO 6107:2021, 3.234]

3.3.5
sedimentation
process of settling and depositing suspended solids in water under the action of gravity

3.3.6
sand filter
device used to remove suspended solids

Note 1 to entry: Sand filter is made up of layers of inert medium, usually quartz/silica sand.

3.3.7
multimedia filter
MMF
layered filtration media in a pressurized container, used to reduce the level of suspended solids (turbidity) in incoming *feed water* (3.1.4)

Note 1 to entry: Media layers can consist of anthracite, activated carbon, quartz/silica sand and garnet.

[SOURCE: ISO 22519:2023, 3.1.3]

3.3.8
self-cleaning filter
filtration system used to reduce the level of suspended solids (turbidity) in incoming *feed water* (3.1.4), as well as automatically clean itself

Note 1 to entry: The self-cleaning filter starts automatic cleaning mechanisms according to the pre-set cleaning cycle or system differential pressure due to the accumulation of suspended solids (turbidity).

3.3.9
microfiltration
MF
pressure driven membrane-based separation process designed to remove particles and dissolved macromolecules in the approximate range of 0,05 µm to 2 µm

[SOURCE: ASTM D6161-2019, 5.1]

3.3.10
ultrafiltration
UF
pressure driven process employing a semipermeable membrane under a hydraulic pressure gradient to separate components in a solution

Note 1 to entry: The pores of the membrane are of a size smaller than 0,1 µm, which allows passage of the solvent(s) but will retain non-ionic solutes based primarily on physical size, not chemical potential.

[SOURCE: ASTM D6161-2019, 5.1, modified — part of the original definition has been moved to Note 1 to entry.]

3.3.11
cartridge filter
device used to further reject the remained foulants in the *feed water* (3.1.4) before *reverse osmosis (RO)* (3.4.2) membranes

Note 1 to entry: The purpose of the cartridge filter is to protect the RO membranes from damage.

3.4 Membrane desalination

3.4.1
high-pressure feed pump
device used to deliver *feed water* (3.1.4) to the *reverse osmosis* (3.4.2) membranes at the pressure required for membrane separation of *desalinated water* (3.1.5) from the seawater

3.4.2
reverse osmosis
RO
separation process where one component of a solution is removed from another component by flowing the feed stream under pressure across a semipermeable membrane that causes selective movement of solvent against its osmotic pressure difference

Note 1 to entry: RO removes ions based on electro chemical forces, colloids, and organics down to 150 molecular mass.

[SOURCE: ASTM D6161-2019, 5.1, modified — part of the original definition has been moved to Note 1 to entry.]