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Wastewater treatment plants

Part 1:

Vocabulary

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In order to match with technological development and to keep continuous progress in industries, standards are subject to periodic review. Users shall ascertain that they are in possession of the latest edition

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Foreword

Rwanda Standards are prepared by Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the WTO/TBT agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by Technical committees are ratified by members of RSB Board of Directors for publication and gazettment as Rwanda Standards.

RS 126-1 was prepared by Technical Committee RSB/TC 013, *Water and Sanitation*

In the preparation of this standard, reference was made to the following standards:

1) EN 1085, Wastewater treatment – Vocabulary

2) EN 752-6, Drain and sewer systems outside buildings – Part 6: Pumping installations.

3) EN 809, Pumps and pump units for liquids – Common safety requirements.

4) EN 12255-9, Wastewater treatment plants — Part 9: Odour control and ventilation.

5) EN 12255-10, Wastewater treatment plants – Part 10: Safety principles.

6) EN 12255-12, Wastewater treatment plants — Part 12: Control and automation

The assistance derived from the above source is hereby acknowledged with thanks.

This second edition cancels and replaces the first edition RS 126-1: 2012 of which has been technically revised.

RS 126 consists of the following parts, under the general title Wastewater treatment plants:

— *Part 1: Vocabulary*
— *Part 2: General construction principles*
— *Part 3: Safety principles*
— *Part 4: General data required*

Committee membership

The following organizations were represented on the Technical Committee on Water and Sanitation (RSB/TC 013) in the preparation of this standard.

Ministry of Environment (MoE)

Ministry of Disaster Management and Refugee Affairs (MIDIMAR)

Ruliba Clays Limited

Shine Engineers Multisectoral Company Limited (SEMC Ltd)

Sulfo Rwanda Industries (SULFO)

University of Rwanda/College of Science and Technology (UR/CST)

Water and Sanitation Corporation Ltd (WASAC Ltd)

Rwanda Standards Board (RSB) – Secretariat

Waste water treatment plant — part 1: vocabulary

1 Scope

This Draft Standard defines key terms used in the field of wastewater treatment plants.

2 Terms and definitions

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

The terms are arranged in 9 groups, as indicated in the contents. Each definition within one group has a successive number with a difference of ten. Remark on the given units: In the last column are shown the most common units.

2.1 General definitions

2.1.1

wastewater

water composed of any combination of water discharged from domestic, industrial, commercial premises or agricultural activities, surface run-off and accidentally any sewer infiltration water

2.1.2

foul wastewater

wastewater comprising domestic and industrial wastewater

2.1.3

sludge

Thick, soft wet mud or similar viscous mixture of liquid and solid components separated from suspension in a liquid in industrial processes and treatment of sewage and wastewater

NOTE the residues of preliminary treatment are not considered as sludge.

2.1.4

population P

number of inhabitants

Example: of a settlement area

2.1.5

population equivalent PE

conversion value which aims at evaluating non-domestic pollution in reference to a domestic pollution fixed at 54 g/d related to BOD_5

Note By extension, other parameters to define the population equivalent can be used (COD, Suspended Solids, daily quantity of wastewater, N, P etc.)

$$PE = \frac{BOD\ load\ from\ industry\ [\frac{kg}{day}]}{0.054[\frac{kg}{inhab.day}]}$$

2.1.6

total number of inhabitants and population equivalents PT

sum of population and population equivalent:

PT = P + PE

Note This sum should be specified with the expression of the equivalence used, e.g. 2 000 PT based on PEB60. The parameter and its value should be the same for the population and the population equivalent

2.1.7

design capacity

maximum flows and loads of the wastewater the facilities are designed for, which conform to the specified consent effluent standard

Note several loads (e.g. BOD_5 load, KN load) and several flows can be used (e.g. dry weather flow Design peak flow).

2.1.8

treatment capacity

maximum flows and loads of the wastewater that can be treated by an existing plant so that it delivers a related effluent which conforms to the specified consent effluent standard

Note several loads (e.g. BOD_5 load, KN load) and several flows can be used (e.g. dry weather flow, design peak flow).

2.1.9

degree of utilization

ratio of actual load to treatment or design capacity of a wastewater system

2.1.10

receiving water

any type of water body where water or wastewater is discharged

2.1.11

final effluent

treated wastewater effluent from the last stage of a wastewater treatment plant

2.1.12

final effluent discharge point

point where the final effluent is discharged into the receiving body

2.1.13

discharge point

point where the final effluent is discharged into the receiving water

2.1.14

discharge consent

statutory approval to discharge wastewater to receiving body or foul sewer

2.1.15

consent effluent standard

limitation on flow, physical, biological and chemical characteristics of effluents, included in a discharge consent

2.1.16

grab sample

‹wastewater engineering› discrete sample taken instantaneously at a precise location

2.1.17

composite sample

‹wastewater engineering› two or more samples or subsamples (either discretely or continuously) mixed together in appropriate known proportions from which the average result of a desired characteristic may be obtained

2.1.18

time proportional sample

Time composite sample made up of equal volumes withdrawn at equal intervals of time

2.1.19

flow proportional sample

flow composite sample made up of either equal volumes taken after equal volumes of liquid have passed the sampling point, or made up of flow proportional volumes taken at equal intervals of time

2.1.20

groundwater table

level below which the ground is saturated with water

2.1.21

bottom water level BWL

minimum operating water level in any structure

2.1.22

top water level TWL

maximum operating water level in any structure

2.1.23

tightness testing

non-destructive test to measure leakage on an isolated structure, pipe etc.

2.1.24

package plant

prefabricated factory-built sewage treatment installation

2.1.25

on site construction

site construction which can include prefabricated modules or units

2.1.26

site assembly

site configuration of prefabricated modules or units

2.1.27

catchment area

area draining to a drain, sewer or watercourse

2.1.28

outfall

structure or point from which wastewater is discharged to a wastewater treatment plant or receiving water

2.2 Types of wastewater and wastewater collection

2.2.1

raw wastewater

wastewater in 2.1.1 which has not undergone any treatment

2.2.2

septic sewage

septic anaerobic wastewater which usually contains hydrogen sulphide

2.2.3

domestic wastewater

wastewater discharged from kitchens, laundry rooms, lavatories, bathrooms, toilets and similar Facilities

2.2.4

industrial wastewater

water discharged after being used in, or produced by, an industrial process, and which is of no further immediate value to that process

2.2.5

urban wastewater

municipal wastewater from municipal areas consisting predominantly of domestic wastewater and additionally it may also contain surface water, infiltration water, trade or industrial wastewater

2.2.6

rain water

water arising from atmospheric precipitation, which has not yet collected matter from the surface

2.2.7

surface water

water from precipitation, which has not seeped into the ground and which is discharged to the drain or sewer system directly from the ground or from exterior building surfaces

2.2.8

heat exchange water

water used to transfer heat

2.2.9

leachate

water which has percolated through contaminated material,

E.g. tipped refuse

2.2.10

combined wastewater

water conveyed in a combined system

2.2.11

combined system

drain and sewer system designed to carry both foul wastewater and surface water in the same pipeline(s)

2.2.12

separate system

drain and sewer system, usually of two pipelines, one carrying foul wastewater and the other surface water

2.2.13

combined sewer overflow

device on a combined system that relieves the system of excess flow

2.2.14

storm water overflow

device within a wastewater treatment plant that relieves the system of excess flow

2.2.15

storm water overflows discharge

excess water from storm water overflow

2.2.16

cesspool

watertight tank, mostly underground, used for collecting sewage from premises not connected to the public sewer and which, unlike a septic tank, has no outflow

2.2.17

pressure main

rising main ‹wastewater engineering› pipeline for conveying wastewater under pressure

2.2.18

vacuum main

‹wastewater engineering› pipeline for conveying wastewater under vacuum

2.2.19

grey water

domestic wastewater excluding faecal matter and urine

2.2.20

black water

domestic wastewater with only faecal matter and urine

2.2.21

infiltration

‹into the ground› the movement of surface water or treated effluent into the ground

2.2.22

infiltration

‹into the drain or sewer system› unwanted flow resulting from ingress of groundwater into a drain or sewer system

2.2.23

exfiltration

escape of wastewater from a drain or sewer system into surrounding ground

2.2.24

detention tank

tank or reservoir for the temporary storage of wastewater

2.2.25

drain

pipeline, usually underground, designed to carry wastewater from a source to a sewer

2.2.26

gravity system

drain or sewer system where flow is caused by the force of gravity and where the pipeline is designed to usually operate partially full

2.2.27

sewer

pipeline or other construction, usually underground, designed to carry wastewater from more than one source

2.2.28

sewer system

network of pipelines and ancillary works which conveys wastewater from drains to a treatment plant or other place of disposal

2.3 Wastewater quantity and quality

2.3.1

flow

‹wastewater engineering› volume of fluid passing a certain cross section per unit of time

2.3.2

peak flow

maximum volume of fluid passing a certain cross-section per unit of time

2.3.3

design peak flow

maximum flow of wastewater a plant is designed to treat

2.3.4

dry weather conditions

period of time during which the influence of rainfall precipitation or snow melt is negligible in terms of flow

Example: consecutive 5 days without rainfall over neither 1 mm/d nor snow melt

2.3.5

dry weather flow

flow not affected by rainfall or snow melt

2.3.6

dry weather peak hourly flow

maximum hourly flow of wastewater during a 24 h-period measured under dry weather conditions

2.3.7

volume of water discharge

Integral of flow over a given time interval

2.3.8

load

‹wastewater engineering› ratio of mass to time

Example mass of BOD_5 per unit of time

2.3.9

concentration

‹wastewater engineering› ratio of mass to volume

Example: mass of BOD_5 per unit of volume

2.3.10

biochemical oxygen demand BOD_t

concentration of dissolved oxygen consumed under specified conditions (*t* days at 20 °C with or without nitrification inhibition) by the biological oxidation of organic and/or inorganic matter in water

2.3.11

chemical oxygen demand COD

concentration of oxygen equivalent to the amount of dichromate consumed when a water sample is treated with that oxidant under defined conditions

2.3.12

total organic carbon TOC

concentration of carbon present in the organic matter which is dissolved or suspended in water

2.3.13

dissolved organic carbon DOC

concentration of organic carbon remaining in solution after filtration under defined conditions

2.3.14

total solids TS

concentrations of the sum of dissolved, suspended and floating solids

2.3.15

suspended solids SS

concentration of solids in a liquid usually determined by filtration or centrifuging and then drying all under specified conditions

2.3.16

dissolved solids

concentration of substances remaining after filtration and evaporation to dryness determined under specified conditions

2.3.17

settle able solids

concentration of the suspended solids having settled under specified conditions

2.3.18

floating solids

undisclosed matter floating on water

2.3.19

total nitrogen N_{tot}

sum of the concentrations of Kjeldahl, nitrite and nitrate nitrogen

2.3.20

kjeldahl Nitrogen KN

concentration of the sum of organic and ammoniacal nitrogen

2.3.21

total phosphorus

concentration of the sum of organic and inorganic phosphorus

2.3.22

dissolved phosphorus

concentration of the sum of organic and inorganic phosphorus measured after filtration under defined conditions

2.3.23

toxic substance

substance which in a low concentration is liable to inhibit biological processes

2.4 Methods, characteristics and Impact on the environment

2.4.1

pretreatment

‹wastewater engineering› modification of the characteristic of a wastewater before discharge to the sewer

2.4.2

preliminary treatment

stage of treatment involving gross solids, sand, grit or floating matter removal from wastewater

2.4.3

primary treatment

stage of treatment involving the removal of suspended solids from raw wastewater or after preliminary treatment

2.4.4

secondary treatment

stage of treatment by biological processes, such as activated sludge or other (even no biological) processes giving equivalent results

2.4.5

biological treatment

stage of treatment by biological processes such as activated sludge

2.4.6

tertiary treatment

advanced treatment additional treatment processes which result in further purification than that obtained by applying primary and secondary treatment

Note it is recommended that the expression for the precise treatment, e.g. nitrogen removal, phosphorus removal, polishing lagoons, disinfection, filtration, is used since in some cases the tertiary treatment can also be integrated in the secondary treatment.

2.4.7

aerobic wastewater treatment

purification of wastewater with the help of aerobic organisms under aerobic or anoxic conditions

2.4.8

anaerobic wastewater treatment

purification of wastewater with the help of microorganisms under anaerobic conditions

2.4.9

multistage biological treatment

series arrangement of identical or different biological process stages with separate biological sledges

2.4.10

aerobic

dissolved oxygen is present

2.4.11

anoxic

dissolved oxygen is absent and nitrite or nitrate is present

2.4.12

anaerobic

dissolved oxygen, nitrate, nitrite and sulphate are absent

2.4.13

degradation

‹wastewater engineering› physical, chemical or bio-chemical process by which wastewater or sludge components are broken down

2.4.14

biodegradation

‹wastewater engineering› degradation of wastewater or sludge components resulting from the activity of living organisms

2.4.15

aerobic degradation

‹wastewater engineering› biodegradation by microorganisms under aerobic or anoxic conditions

2.4.16

anaerobic degradation

‹wastewater engineering› biodegradation by microorganisms under anaerobic conditions

2.4.17

total respiration

exchange of gases between an organism and its environment resulting from oxidation with the release of energy under aerobic or anoxic conditions

Note Sum of substrate respiration and endogenous respiration

2.4.18

substrate

nutrition for microorganisms in the wastewater treatment

2.4.19

respiration rate

rate of oxygen consumption due to respiration

2.4.20

substrate respiration

consumption of oxygen by organisms due to the biodegradation of added substrate

2.4.21

endogenous respiration

consumption of oxygen by organisms without addition of a substrate

2.4.22

eutrophication

enrichment of water, both fresh and saline, by nutrient salts, especially compounds of phosphorus and nitrogen, that will accelerate the growth of algae and higher forms of plant life

2.4.23

nutrient salts

inorganic matter necessary for the nutrition of organisms

Example N, S, P and trace elements

2.4.24

nutrient salts removal

biological, physical or chemical processes used in wastewater treatment specifically for the removal of phosphorus and nitrogen compounds

2.4.25

ammonification

conversion of compounds containing organic nitrogen to ammonium ions

2.4.26

nitrification

oxidation of ammonium ions by bacteria, usually to the end product nitrate

2.4.27

denitrification

reduction of nitrate or nitrite to liberate mainly nitrogen gas by the action of bacteria

2.4.28

plug-flow system

theoretical system with complete mixing in the cross-section of the flow and with neither diffusion nor dispersion in the direction of flow

2.4.29

completely mixed system

theoretical system with a uniform concentration of components

2.4.30

power per unit volume of reactor

measured or installed electrical power of driving motor of a mixing and/or aeration device, relative to volume of a reactor

2.4.31

retention period

detention time theoretical period during which a fluid is retained in a particular unit or system as calculated by the ratio of its volume divided by the flow of fluid excluding recycled flows

2.4.32

degree of separation

‹wastewater engineering› ratio of mass separated in a separation process to the introduced mass of a substance

2.4.33

contact time

‹wastewater engineering› time available to wastewater for contact with other media or substances

2.4.34

volumetric loading

ratio of load to volume of treatment module

2.4.35

surface loading rate

ratio of flow to surface area

Example The volume of wastewater or sludge treated per unit time per unit horizontal cross-sectional area of that part of the treatment plant under consideration.

2.4.36

mass surface loading rate

mass of components introduced per unit time and surface area unit

Example Solids loading of sedimentation tanks or BOD_5 loading of the filter medium of biological filters.

2.4.37

settling velocity

‹wastewater engineering› rate of settling of solids determined under specified conditions

Example by settling curve

2.4.38

weir-overflow rate

flow passing over the unit length of weir

2.4.39

settlement tank

sedimentation tank structure for separation of particles from wastewater under the influence of gravity

Example primary settlement tank, intermediate settlement tank, secondary settlement tank or clarifier

2.4.40

scraper

‹wastewater engineering› mechanical device for removal of settled or floating material

2.4.41

flotation process

raising of suspended matter in liquid to the surface by the entrainment of a gas

2.4.42

floating sludge

scum floating solid material separated from sludge or wastewater

2.4.42

scum board

vertical board partly immersed in a tank or pond to retain floating material

2.4.43

stripping

removal of volatile components from liquids by gas exchange

2.4.44

biological seeding

introduction of appropriate microorganisms into a biological system in order to initiate or enhance a biological process

2.4.45

disinfection

‹wastewater engineering› treatment of wastewater or sludge to reduce pathogenic activity below a specified level

2.4.46

flow splitter

chamber or channel arrangement designed to divide a flow into required proportions

2.4.47

baffle

device used in a tank to reduce eddies and promote a more uniform flow through the tank

2.4.48

dosing point

‹wastewater engineering› position at which chemicals are added to wastewater or sludge in a treatment plant

2.4.49

wastewater treatment plant

facility for the physical, biological and/or chemical treatment of wastewater

2.4.50

physico-chemical treatment of wastewater

treatment of wastewater by addition of chemical(s)

2.4.51

semi permeable membrane

material used as filter material in membrane filtration processes

2.4.52

cross flow filtration

filtration with a significant flow parallel to the membrane surface, which is intended to prevent substances from accumulating on the surface of the membrane

2.4.53

dead end filtration

filtration without a significant flow parallel to the membrane surface

2.4.54

granular media filter

bed of filter material which is submerged in either an up flow or down flow of effluent to remove solids within the bed

2.4.55

drum filter

cylindrical cloth filter which rotates about a horizontal axis and is immersed in a horizontal flow of effluent to remove solids

2.4.56

micros trainer

cylindrical sieve which rotates about a horizontal axis and is partially immersed in a horizontal flow of effluent to remove solids

2.5 Preliminary and primary treatment

2.5.1

screen

device for removing particles and objects from a flow of wastewater

Example by retention on manually or mechanically raked bars, on moving bands, rotating discs or drums of perforated metal sheet or of wire mesh

2.5.2

sieve

device for removing fine solids from a flow of wastewater

EXAMPLE by retention on moving bands, rotating discs or drums of perforated sheet, wire mesh or filter bags

Note Sieves usually have smaller openings than screens.

2.5.3

screenings

matter retained by a screen or a sieve

2.5.4

screening press

mechanical device for reducing volume and water content of screenings

2.5.5

macerator

comminutor shredding device for reducing the size of coarse particles

2.5.6

grit separator

structure or mechanical device for separating and removing grit, sand or similar mineral material from wastewater

2.5.7

grit chamber

structure for separating grit, sand or similar mineral matter from wastewater

2.5.8

aerated grit chamber

structure for separating sand and other mineral matter from wastewater, using air to induce circulation and may be combined with the removal of floating matter

2.5.9

grit classifier

mechanical device to remove solid material from a grit separator while simultaneously reducing its water and organic content

2.5.10

grease separator

oil separator structure or device for separation of grease, oil or other floating material from wastewater

2.5.11

balancing

equalization reduction in variations in flow, concentration, temperature etc.

2.5.12

balancing tank

structure which permits reduction in variations in flow, concentration, temperature etc.

2.5.13

primary settlement tank

settlement tank in which the majority of settle able solids are removed by sedimentation from raw or preliminarily treated wastewater

2.5.14

lamella separator

system of regularly spaced, inclined plates or tubes, designed to increase the effective settling area in a settlement tank

2.6 Fixed film treatment

2.6.1

biological film

layer consisting of microorganisms which forms on the surface of support media

2.6.2

fixed film reactor

reactor in which most of the biological treatment is achieved by a biological film attached to support media

2.6.3

biological filter

trickling filter percolating filter fixed film reactor with a bed of support media through which wastewater percolates

Note Aeration may occur by natural or artificial ventilation.

2.6.4

biological contactor

fixed film reactor the biological film of which is intermittently or continuously immersed in wastewater, sometimes combining active aeration

2.6.5

submerged bed reactor

type of fixed film reactor in which the support media is submerged in the wastewater flow

2.6.6

granular fixed bed reactor

biofilterfixed film reactor using granular material as a medium which combines filtration and biochemical degradation

2.6.7

fluidized bed reactor

‹wastewater engineering› fixed film reactor in which a bed of particles is freely suspended by an upward flow of liquid, gas or combined liquid and gas

2.6.8

sand filter

constructed filter using sand as filter material

2.6.9

constructed wetland

construction near to nature using helophyte plants supporting bacterial action in the gravel or sand for treatment of wastewater

2.6.10

support media

inert material of various specific surfaces on which an attached film grows

2.6.11

support media specific surface

property of support media expressed as surface area per unit volume measured under specified conditions,

e.g. material without biofilm

2.6.12

filter dosing chamber

small tank which receives settled wastewater until the desired volume has accumulated, when it is discharged automatically to the distributor of a biological filter

2.6.13

filter distributor

device for uniform distribution of wastewater on biological filters

2.6.14

humus sludge

biological film which has sloughed off from a biological filter and is usually separated from the treated wastewater in an intermediate or secondary settlement tank

2.6.15

humus tank

intermediate or secondary settlement tank downstream of a biological filter

2.6.16

recirculation

Return of a proportion of fixed film reactor effluent to mix with the influent

2.7 Activated sludge treatment

2.7.1

activated sludge process

process for the biological treatment of wastewater in which a mixture of wastewater and activated sludge is agitated and aerated, subsequently separated from the treated wastewater and is returned to the process

Note some activated sludge is removed from the process as excess sludge.

2.7.2

activated sludge

biological mass (flocs) produced in the treatment of wastewater by the growth of suspended bacteria and other microorganisms under aerobic or anoxic conditions

2.7.3

returned activated sludge

activated sludge which has been separated from mixed liquor in the secondary settlement tank for further use in the activated sludge process

2.7.4

return sludge ratio

ratio of return activated sludge flow to the wastewater inflow

2.7.5

denitrification mixed liquor Recirculation ratio

ratio of recirculated nitrate rich mixed liquor from an aeration tank to the gentrification zone divided by the incoming flow

2.7.6

mixed liquor

mixture of wastewater and activated sludge undergoing treatment of an activated sludge plant

2.7.7

mixed liquor suspended solids MLSS

concentration of suspended solids in the mixed liquor

2.7.8

mixed liquor volatile suspended Solids MLVSS

concentration of organic suspended solids in the mixed liquor

2.7.9

surplus activated sludge

waste activated sludge excess sludge which is removed from an activated sludge process

2.7.10

specific surplus sludge production

ratio of mass of suspended solids of surplus sludge to unit mass of BOD5 removed

2.7.11

sludge age

calculated time required to waste the total inventory of sludge being in the process tanks (excluding the clarifiers and anaerobic zones and including the aerobic and anoxic zones) at a constant wastage rate and taking the treated Wastewater solids into account

2.7.12

mean cell residence time MCRT

calculated time required to waste the total inventory of sludge in an activated sludge plant (including clarifiers, aerobic, anoxic and anaerobic zones etc.) at a constant wastage rate and taking the treated wastewater solids into account

Note Sludge age taking into account all the treatment works.

2.7.13

sludge loading F/M

load of pollutants entering the biological treatment per unit mass of mixed liquor suspended solids or mixed liquor volatile suspended solids

Note the basis may be total or volatile suspended solids.

2.7.14

SBR reactor

activated sludge wastewater treatment with discontinuous operation in one tank

Note Operations are filling, mixing, aerating, settling and decanting.

2.7.15

aeration

‹wastewater engineering› introduction of air or Oxygen

2.7.16

tapered aeration /Stepped aeration)

step aeration type of activated sludge plant aeration whereby a greater quantity of air is admitted to the upstream end of the plug flow aeration tank where the highest biological activity exists, and a lesser mount of air is admitted to the downstream end of the tank

2.7.17

aeration tank

structure in which wastewater and activated sludge are mixed and aerated

2.7.18

oxidation ditch

type of aeration tank taking the form of usually parallel channels joined at the ends to form a closed circuit

2.7.19

contact stabilization

type of activated sludge process whereby the return sludge is aerated separately

2.7.20

extended aeration

activated sludge process where a long aeration phase enables reduction of organic material in the sludge

2.7.21

oxygen concentration

mass of oxygen dissolved per unit volume of water or wastewater

2.7.22

oxygen saturation value

concentration of dissolved oxygen in water or wastewater in equilibrium, either with air (natural systems) or with pure oxygen (oxygen wastewater treatment systems)

Note it varies with temperature, partial pressure of oxygen and salinity

2.7.23

oxygen uptake rate

mass of oxygen consumed per unit time and per unit volume of mixed liquor

2.7.24

oxygen transfer capacity under Process conditions OC

mass of oxygen that under process conditions can be transferred into mixed liquor per unit time

2.7.25

oxygen transfer capacity in clean water OC

mass of oxygen that under standard conditions an aeration device or system can transfer into clean water per unit time

2.7.26

OC/load in clean water

ratio of oxygen transfer capacity in clean water to BOD-load

2.7.27

alpha factor

ratio of the oxygen transfer coefficient in mixed liquor to the oxygen transfer coefficient in clean water

2.7.28

oxygen saturation factor

beta factor ratio of the oxygen saturation value in mixed liquor to the oxygen saturation value in clean Water at the same temperature and atmospheric pressure

2.7.29

gross oxygen transfer efficiency under process conditions

ratio of oxygen transfer capacity in mixed liquor suspended solids to power consumption measured at the motor terminals

2.7.30

clarifier

secondary settlement tank settlement tank in which activated or humus sludge is separated from the effluent of an activated sludge plant or biological filter

2.7.31

static, up flow settlement tank

dortmund tank funnel-shaped sedimentation tank with mainly vertical flow and mostly central wastewater Inlet

2.7.32

sludge blanket

layer of freely suspended sludge between the overflow level and the inflow level in an up-flow clarifier or in an up-flow anaerobic sludge blanket reactor

2.7.33

sludge blanket filtration

effect of the sludge blanket as filter when being passed by mixed liquor

2.7.34

sludge blanket level

depth of sludge/supernatant interface below the surface of the clarifier

2.7.35

sludge volume surface loading

volume of sludge being passed through the horizontal cross-sectional area of a settlement tank per unit of time

Note it is calculated as the product of surface loading rate and settled sludge volume.

2.7.36

settled sludge volume

volume of sludge per litre of wastewater or mixed liquor settled after 30 min

2.7.37

sludge volume index SVI

volume in milliliters occupied by 1 g of activated sludge after settlement under specified conditions

Note Specific conditions can include dilution, stirring and specified time, usually 30 min.

2.7.38

sludge bulking

activated sludge that occupies an excessive volume and is difficult to be settled and thickened

Note usually associated with the excessive presence of filamentous organisms.

2.8 Other wastewater treatment

2.8.1

wastewater lagoon

wastewater pond basin of simple construction, mostly earth bank structure for wastewater treatment

Example: oxidation pond, aerated lagoon or maturation pond

2.8.2

settlement lagoon

settlement pond wastewater lagoon used for the separation of solids from wastewater

2.8.4

oxidation pond

stabilization pond wastewater lagoon without artificial aeration in which mainly aerobic degradation occurs

2.8.5

anaerobic lagoon

wastewater lagoon for wastewater settlement and anaerobic degradation and digestion of sludge

2.8.6

maturation pond

wastewater lagoon used as tertiary treatment, typically for the removal of pathogenic microorganisms by exposure to solar radiation by competition and predation mechanisms

Note See also 8080 “effluent polishing”.

2.8.7

natural lagooning

biological wastewater treatment consisting of a series of wastewater lagoons without artificial aeration

2.8.8

effluent polishing

further stage of treatment improving the quality of secondary effluent by removing suspended solids

Example: polishing lagoon or filtration

Note Consequential removal of residual BOD_5 may occur.

2.8.9

land treatment

irrigation treatment (and usually disposal) of wastewater, by spreading it on the land for subsoil infiltration

2.8.10

percolation

disposal of suitably treated wastewater into subsoil without agricultural objective

Example: through a soak away, an infiltration gallery or a network of subsoil drains

2.8.11

subsoil drain

pipe that disposes water into subsoil

2.8.12

soak away

pit or other drainage arrangement prepared in permeable ground to which treated wastewater is fed and from which it soaks into the ground

2.8.13

chemical precipitation

conversion of components dissolved in water into undissolved form by chemical reaction with a precipitant

2.8.14

precipitant

chemical used to bring about precipitation

2.8.15

coagulation

‹wastewater engineering› destabilization of undissolved and colloidally dispersed matter to allow aggregation, usually by addition of coagulants

2.8.16

coagulant

‹wastewater engineering› chemical added to destabilize suspensions or emulsions

2.8.17

flocculation

‹wastewater engineering› formation of separable flocs by aggregation of small particles

Note the process is usually assisted by mechanical, physical, chemical or biological means.

2.8.18

flocculent

‹wastewater engineering› chemical which is added to produce flock aggregates or to increase or strengthen flocs

2.8.19

filter material

‹wastewater engineering› inert material with various particle or pore sizes used for filtration

2.9 Sludge treatment

2.9.1

sludge treatment

all stages of transformation of sludge for its utilization or disposal

Note this can include sludge thickening, sludge stabilization, sludge conditioning, thermal hydrolysis, dewatering, drying, disinfection, incineration.

2.9.2

sludge disposal

‹wastewater engineering› disposal of sludge without environmental benefit

EXAMPLE sludge or incineration ash to landfill

2.9.3

sludge utilization

‹wastewater engineering› utilization of sludge with environmental benefit

2.9.4

sludge characterization

description of the physical, mechanical, chemical and biological properties of sludge

2.9.5

raw sludge

sludge removed from primary sedimentation tanks

Note 1 to entry: It may include primary sludge, co-settled with recycled secondary sludge

2.9.6

primary sludge

sludge removed from primary treatment unmixed with other recycled sludges

2.9.7

mixed primary sludge

sludge removed from primary treatment which contains other sludges, e.g. waste activated sludge

2.9.8

secondary sludge

sludge separated after secondary treatment

2.9.9

biological sludge

sludge separated after biological treatment

2.9.10

physico-chemical sludge

sludge separated after chemical precipitation

2.9.11

stabilization

‹wastewater engineering› process whereby organic substances (dissolved or particulate) are converted to materials which are either inorganic or very slowly degradable

2.9.12

stabilized sludge

sludge which has been subjected to a stabilization process, thereby reducing its tendency for biological degradation

2.9.13

degree of stabilization

degree of degradation achievable by sludge stabilization

Note Measured e.g. by the reduction of organic material.

2.9.14

anaerobic sludge digestion

anaerobic process which reduces the organic content of sludge

2.9.15

aerobic sludge digestion

aerobic process which reduces the organic content of sludge

2.9.16

anaerobicly digested sludge

sludge stabilized by anaerobic digestion

2.9.17

aerobically digested sludge

sludge stabilized by aerobic digestion

2.9.18

digester

digestion tank reactor for digestion

2.9.19

septic tank

closed sedimentation tank in which settled sludge is in immediate contact with the wastewater flowing through the tank, and the organic solids are partially decomposed by anaerobic bacterial action

2.9.20

Imhoff tank

two-storey structure the upper part of which serves as a settlement tank whilst its lower part serves as an anaerobic digester

2.9.21

digester gas

biogas gas mixture generated during anaerobic digestion comprising mainly methane (CH_4) and carbon dioxide (CO_2)

2.9.22

digestion time

ratio of effective volume of digester to mean daily sludge volume input

Note if supernatant is withdrawn from the digester, the digestion time is shorter than the mean solids retention time.

2.9.23

digester solids retention time

ratio of total inventory of solids in a completely mixed digester to the mean daily output of suspended solids, taking the suspended solids of removed supernatant into account

2.9.24

pasteurization

process, involving the elevation of temperature for an appropriate period of time, for the purpose of either inactivating microorganisms, particularly pathogens, or decreasing their number for a limited period of time below a specified level or a value lower than the infectious threshold

2.9.25

sludge thickening

sludge concentration process, with or without chemical treatment, such as gravity decantation or flotation and keeping it in liquid state

2.9.26

thickener

device for sludge thickening usually proceeding dewatering

2.9.27

picket fence

slow-speed rotary device in a thickener comprising vertical bars mostly provided with a scraper

2.9.28

sludge lagoon

lagoon for storage of sludge

2.9.29

sludge conditioning

physical, chemical, thermal or other treatment of sludge to facilitate dewatering

2.9.30

chemical conditioning

conditioning by addition of chemicals

2.9.31

thermal conditioning

conditioning by altering sludge temperature

2.9.32

sludge dewatering

reduction of the water content of sludge by the use of one or several technologies, usually by natural or mechanical means

2.9.33

sludge drying bed

structure for sludge dewatering and eventually drying of sludge by drainage and evaporation

2.9.34

filter capacity

mass of dry solids retained or sludge volume passed per unit time and per unit filter area or other suitable dimension

2.9.35

filter cake

‹wastewater engineering› solid or semi-solid residue produced during sludge dewatering by a filtering-process

2.9.36

sludge liquor

Liquor separated from sludge

NOTE Sludge liquor can be called:

a) supernatant (thickener, digestes),

b) filtrate (filter),

c) centrate (centrifuge) etc.

2.9.37

supernatant liquor

liquor in a tank lying above the deposited solids

2.9.38

post conditioning of sludge

physical, chemical, thermal or other treatment of sludge to facilitate sludge disposal or utilization after dewatering

2.9.39

thermal sludge drying

process whereby water is removed from sludge by evaporation

2.9.40

sludge incineration

high-temperature oxidation of sludge organic material

2.9.41

dried solid content

ratio of the mass of total solids to total mass of sludge

2.9.42

psychrophilic

temperature range for organisms active typically below 30 °C

2.9.43

mesophilic

temperature range for organisms active at temperatures typically between 30 °C and 45 °C

2.9.44

thermophilic

temperature range for organisms active at temperatures typically over 45 °C

2.9.45

conditioned sludge

sludge treated physically or chemically to improve dewater ability

2.9.46

dewatered sludge

sludge, in which the water content has been reduced by natural or mechanical means

2.9.47

dried sludge

sludge in which the water content has been reduced to a low level by evaporation

2.9.48

industrial sludge

sludge from the treatment of industrial wastewater

2.9.49

sludge cake

sludge generated from dewatering devices

Example filter press, centrifuge..

Bibliography

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