

## Biofiltration-Related Terminology

Term	Definition
<b>Acclimation Period</b>	The time that passes before a process is ready to perform at its best; sometimes called lag time.
<b>Adenosine-5'-triphosphate (ATP)</b>	A compound found in all living cells in which energy is stored in high-energy phosphate bonds. Its components are the purine, adenine, ribose, and three phosphoric acid groups.
<b>Aerobe</b>	Any organism requiring free oxygen (O <sub>2</sub> ) or air to maintain its life processes.
<b>Aerobic bacteria</b>	See aerobe.
<b>Aerobic biofilters</b>	Biofilters that rely on the growth and activity of microorganisms that use oxygen as the electron acceptor.
<b>Aerobic condition</b>	An environmental condition in which oxygen is available. In water this means that dissolved oxygen is present.
<b>Aerobic treatment</b>	A biological treatment technique, in which oxygen is present, used to oxidize and remove from water soluble or fine material, usually organic in nature.
<b>Air pocket</b>	A location within a pipeline or filtering medium in which air has collected.
<b>Air scour</b>	The practice of admitting air through the underdrain system of a filter to help complete cleaning of media during filter backwash.
<b>Air stripping</b>	A process that removes volatile compounds from a liquid phase by passing air through the liquid.
<b>Aliquot</b>	A representative portion of a sample, often an equally divided portion.
<b>Alkalinity</b>	A measure of the capacity of a water to neutralize strong acid.
<b>Anaerobe</b>	Organisms that can grow in the absence of oxygen.
<b>Anaerobic bacteria</b>	See anaerobe
<b>Anoxic/anaerobic bioreactors</b>	Reactors that rely on the growth and activity of microorganisms that use electron acceptors other than oxygen (e.g., nitrate and perchlorate).
<b>Anoxic treatment</b>	A treatment used to remove organic and inorganic contaminants using electron acceptors other than oxygen
<b>Anoxic/anaerobic condition</b>	An environmental condition in which oxygen is not available as a terminal electron acceptor.
<b>Analyte</b>	The substance for which an analysis is performed.

<b>Analytical method</b>	An analysis for which the description is sufficiently detailed to be set up in a laboratory.
<b>Anionic</b>	Having a negative ionic charge.
<b>Anionic polymer</b>	A negatively charged polymeric compound used to assist in removing particles from water.
<b>Anthracite</b>	A particular form of coal that is used in granular media filters to remove particles from water.
<b>Anthracite-sand filter</b>	A granular filter in which a layer of crushed anthracite coal of a specified size is placed over a layer of sand of a specified size.
<b>Aquifer storage and recovery (ASR)</b>	A management strategy in which excess water is treated and recharged to an aquifer system for later withdrawal and use.
<b>Aseptic</b>	Free from living organisms causing fermentation or putrefaction; sterile.
<b>Assimilable organic carbon (AOC)</b>	The fraction of dissolved organic carbon (DOC) that can be easily assimilated by microorganisms and converted to cell biomass. AOC is a measure of organic material available for microorganisms to grow on and also as bacterial regrowth potential in distribution systems.
<b>Autotrophic bacteria (autotrophs)</b>	Bacteria that obtain energy through the oxidation of inorganic compounds and have the ability to fix carbon dioxide (CO <sub>2</sub> ) as their sole source of carbon.
<b>Available chlorine</b>	A measure of the amount of chlorine in chlorinated compounds, such as chlorinated lime, hypochlorite compounds, and chloramines that are used for disinfection as compared to the amount in elemental (liquid or gaseous) form.
<b>Available pressure head</b>	The pressure, or head, available to drive water through a granular media filter.
<b>Backwash</b>	The process of reversing flow through a (bio)filter to remove accumulated particles and biomass.
<b>Backwash rate</b>	The flow of water used during backwash per unit of a (bio)filter area, expressed as volume per unit time per unit surface.
<b>Backwash stage</b>	A specific action in the sequence of actions that form the backwash process. Examples of backwash stages include filter drawdown, air scour, fluidization, and filter-to-waste.
<b>Backwash volume</b>	The volume of water used to backwash a filter during the filter cycle.
<b>Bacteria</b>	Microscopic unicellular organisms having a rigid cell wall.

<b>Bacterial regrowth</b>	The presence of a persistent population of bacteria in a basin or water distribution system.
<b>Bacterial regrowth potential</b>	An assessment of the potential for bacteria present in treated drinking water to increase in density.
<b>Bed</b>	The mass of granular media through which water passes during (bio)filtration.
<b>Bed depth</b>	The height of the granular media, excluding support material, in a bed.
<b>Bed expansion</b>	The effect produced during backwashing when filter media becomes separated and rises above its resting position.
<b>Bioavailability</b>	A measure of the extent to which a chemical is available for systemic absorption by an organism.
<b>Biochemical</b>	Pertaining to chemical change resulting from biological action.
<b>Biochemistry</b>	The branch of chemistry that deals with the chemical reactions involved in the life processes of plants and animals.
<b>Biodegradability</b>	The susceptibility of a compound to decomposition by microorganisms.
<b>Biodegradable</b>	Subject to degradation into simpler substances by biological action.
<b>Biodegradable organic carbon (BDOC)</b>	A portion of the organic carbon in water that can be degraded by heterotrophic microorganisms.
<b>Biodegradable organic matter (BOM)</b>	A portion of the organic matter in water that can be degraded by microorganisms.
<b>Biodegradation</b>	The breakdown of organic matter by microorganisms.
<b>Biofilm</b>	A layer of microorganisms held together and found at the interface between water and a solid substrate in an aquatic environment.
<b>Biofilm formation potential</b>	Effect of various parameters that influence the formation, promotion, and stability of biofilms and the subsequent impact on water quality in the distribution system.
<b>Biofilter</b>	Granular media, such as GAC, anthracite, or sand that has developed a biofilm capable of degrading organic matter or any inorganic electron donor (e.g., NH <sub>3</sub> ).
<b>Biofouling</b>	A phenomenon in which the performance of a unit process is compromised by biological growth.

<b>Biohazard</b>	An infectious agent presenting a risk or potential risk to human health, either directly through infection or indirectly through disruption of the environment.
<b>Biindicator</b>	An organism that produces an observable response on exposure to a given substance.
<b>Biological denitrification</b>	The transformation of nitrate nitrogen ( $\text{NO}_3\text{-N}$ ) to nitrogen gas ( $\text{N}_2$ ) by microorganisms in an oxygen-free (anoxic) environment and in the presence of an electron donor to drive this reaction.
<b>Biological deposits</b>	Deposits of organisms or the products of their life processes.
<b>Biological filtration (biofiltration)</b>	The process of filtering water through media that has been allowed to develop a microbial biofilm that assists in the removal of particulate matter, dissolved organic materials, and other contaminants.
<b>Biologically active carbon</b>	Granular activated carbon (GAC) used as a biogrowth support medium.
<b>Biological stability (biostability)</b>	A biochemical condition in which the nutrient status of treated drinking water is such that the water will not support (or will minimally support) the growth of microorganisms.
<b>Biomass</b>	The total weight of biological matter, including any attached extracellular polymeric materials.
<b>Bioreactor</b>	A vessel in which a biological process takes place.
<b>Bioregeneration</b>	A process in which exhausted adsorption sites are biologically regenerated or made available for future adsorption.
<b>Buffer</b>	A chemical substance that stabilizes the pH value of solutions.
<b>Cationic</b>	Having a positive ionic charge.
<b>Chemolithotroph</b>	Bacteria that obtain energy by chemical oxidation of inorganic substances, such as hydrogen, ammonium, and iron (II). Autotrophs are chemolithotrophs with the capability of fixing carbon dioxide ( $\text{CO}_2$ ) as the sole source of carbon.
<b>Chemoorganotroph</b>	Bacteria that obtain energy and carbon through the oxidation of organic compounds.
<b>Collapsed pulsing backwash</b>	A method of cleaning a filter by introducing air and subcritical fluidization backwash water, causing the formation and collapse of air pockets within the bed. This condition enhances the abrasion between (bio)filter media grains to assist in particle removal.
<b>Cometabolism</b>	Process by which microorganisms transform substrates into organic

	products but do not obtain energy, carbon, or nutrients from the conversion.
<b>Dechlorination</b>	The process of removing chlorine from solution.
<b>Decomposition</b>	The conversion of chemically unstable materials to more stable forms by chemical or biological action.
<b>Degasification</b>	The removal of dissolved gases from water to reduce their impact on water treatment (e.g., water quality, filter operation (via air binding), pump cavitation, corrosion).
<b>Deoxygenation</b>	The depletion of dissolved oxygen in a liquid either under natural conditions associated with biochemical oxidation of organic matter or through the addition of chemical reducing agents.
<b>Desorption</b>	The movement of a previously adsorbed constituent into the liquid phase.
<b>Diffuser</b>	Device of varied design that transfer gas into a liquid.
<b>Disinfectant</b>	An agent that destroys or inactivates microorganisms.
<b>Disinfectant decay</b>	The loss or decline of disinfectant concentration or residual over time.
<b>Disinfectant demand</b>	The amount of disinfectant required to sustain a disinfectant residual.
<b>Disinfectant stability</b>	The ability of a disinfectant to resist degradation.
<b>Disinfection by-product (DBP)</b>	A chemical by-product of the disinfection process.
<b>Disinfection by-product formation potential (DBPFP)</b>	The potential of a given water to produce DBPs when exposed to a disinfectant over a given time period.
<b>Disinfection by-product precursor</b>	A substance that can be converted into a disinfection by-product during disinfection.
<b>Dissolved organic carbon (DOC)</b>	The portion of total organic carbon that passes through a 0.45 micron filter.
<b>Dissolved oxygen (DO)</b>	The concentration of oxygen in aqueous solution.
<b>Dual media filter</b>	A filter containing two types of granular filtering media with different sizes and specific gravities to maintain media stratification during backwashing.
<b>Effective size</b>	The granular media particle diameter ( $d_{10}$ ) for which 90 percent of a sample, by mass, has an equivalent or larger diameter.
<b>Empty bed contact time (EBCT)</b>	A measure of the time when water is in contact with the granular media bed in a (bio)filter. EBCT is calculated by dividing the total volume of the media

	bed (including all pore space) by the flow rate across the bed.
<b>Extracellular polymeric substances (EPS)</b>	Material released outside the cell by microorganisms. These substances are primarily polysaccharides and exist as highly hydrated gels and fibers surrounding, encapsulating, or connecting a consortium of microbial species in an aquatic environment (i.e., biofilm).
<b>Filter core</b>	Vertical media sample collected from a (bio)filter.
<b>Filter draw down</b>	The process of lowering the free water surface above filter media. Filter drawdown typically is performed prior to filter backwash.
<b>Filter run</b>	The time interval between backwashes.
<b>Filter-to-waste</b>	The practice of discharging filtered water directly to disposal immediately following a backwash. Filter-to-waste is typically performed for a period of 5-10 minutes following backwash, or until the filtered water is of acceptable quality.
<b>Filtration rate</b>	The flow of per unit of (bio)filter area, expressed as volume per unit time per unit surface area.
<b>Fixed bed column</b>	A treatment unit containing media that remain stationary during the course of treatment.
<b>Floc</b>	Collection of smaller particles that have agglomerated into larger particles as a result of the coagulation-flocculation process.
<b>Flocculant</b>	A water-soluble organic polyelectrolyte that is used alone or in conjunction with inorganic coagulants, such as aluminum or iron salts, to agglomerate solids present in water to form large, dense, floc particles that settle rapidly.
<b>Flow equalization</b>	The use of storage tanks to control a changing flow of water and make it nearly uniform with time.
<b>Granular activated carbon (GAC)</b>	A form of particulate carbon manufactured with increased surface area per unit mass to enhance the adsorption of soluble contaminants.
<b>Granular activated carbon cap</b>	A layer of GAC on top of a sand/anthracite filter, used for adsorption.
<b>Headloss</b>	A reduction of water pressure (head) in a hydraulic or plumbing system. Head loss is a measure of (1) the resistance of a medium bed (or other water treatment system), a plumbing system, or both to the flow of the water through it, or (2) the amount of energy used by water in moving from one location to another.
<b>Heterotrophic bacteria</b>	Bacteria that use organic carbon for cell synthesis and energy.

<b>Hydraulic loading</b>	The amount of water applied to a give treatment process, usually expressed as volume per unit time or volume per unit time per unit surface.
<b>L/d ratio</b>	Ratio of media depth to the effective size ( $d_{10}$ ) of the media, commonly used in establishing minimum filter media depths.
<b>Metabolism</b>	The biotransformation of various chemicals by an organism.
<b>Metabolite</b>	The end product of the biotransformation of various chemicals by an organism.
<b>Microbial activity</b>	The activities of microorganisms resulting in biological, chemical or physical changes.
<b>Microbial community</b>	Microbial populations present in a biological system.
<b>Micronutrient</b>	A beneficial element that is needed only at trace concentrations.
<b>Microorganism</b>	A microscopic organism, either plant or animal, invisible to the naked eye.
<b>Mixed media</b>	A combination of two or more media products in a single loose-media filtration bed where the products are intermixed rather than stratified in layers.
<b>Natural Filtration</b>	The removal of particles or contaminants through in situ soil treatment.
<b>Nitrification</b>	The oxidation of ammonia that produces nitrite and nitrate.
<b>Nitrogen fixation</b>	The use of free nitrogen gas ( $N_2$ ) in the formation of nitrogen compounds during some forms of biological activity.
<b>Rapid granular filter</b>	A filter in which particulates are removed by granular media through which water flows, typically by gravity. A rapid granular filter typically operates at design filtration rate of approximately 2 gpm per square foot or higher.
<b>Riverbank filtration</b>	A process of collecting water in an infiltration gallery located within a bank along a river to allow the river water to pass through the soil in the riverbank.
<b>Slow sand filter</b>	A biologically active filter characterized by a slow rate of filtration, commonly 0.015-0.15 gallons per minute per square foot filter area.
<b>Soluble microbial products (SMP)</b>	By-products of biological activity that are released during (bio)filtration.
<b>Surface wash</b>	A supplementary method of washing filter media by applying water under pressure at or near the surface of the media by means of a system of stationary or rotating jets.
<b>Total organic carbon</b>	A measure organic carbon in water that includes both dissolved and

<b>(TOC)</b>	particulate carbon.
<b>Turbidity</b>	A measure of the cloudiness of water or a measure of how much suspended material inhibits the passage of light through water.
<b>Underdrain</b>	A support underneath (bio)filter media that collects treated water and distributes backwash water and air during backwashing.
<b>Uniformity coefficient</b>	<p>A measure of the distribution of granular media particle sizes, calculated as <math>d_{60}/d_{10}</math></p> <p>Where,</p> <p><math>d_{60}</math>= the grain size, in millimeters, for which 60 percent (by weight) of the media's grains are finer</p> <p><math>d_{10}</math>= the grain size, in millimeters, for which 10 percent (by weight) of the media's grains are finer</p>
<b>Unit filter backwash volume</b>	The volume of backwash water used during a backwash per unit area filter media.
<b>Unit filter run volume</b>	The volume of water filtered per run per unit area of filter media.