

Glossary of Terms

Activated Sludge: Sludge particles produced in raw or settled wastewater (primary effluent) by the growth of organisms (including zoogeal bacteria) in aeration tanks in the presence of dissolved oxygen. The term "activated" comes from the fact that the particles are teeming with bacteria, fungi, and protozoa. Activated sludge is different from primary sludge in that the sludge particles contain many living organisms that can feed on the incoming wastewater.

Activated Sludge Process: A biological wastewater treatment process that speeds up the decomposition of wastes in the wastewater being treated. Activated sludge is added to wastewater and the mixture (mixed liquor) is aerated and agitated. After some time in the aeration tank, the activated sludge is allowed to settle out by sedimentation and is disposed of (wasted) or reused by returning it to the beginning of the aeration process as needed. The remaining wastewater then undergoes more treatment.

Aeration: The process of adding air. In wastewater treatment, air is added to freshen wastewater and to keep solids in suspension. With mixtures of wastewater and activated sludge, adding air provides mixing and oxygen for the microorganisms treating the wastewater.

Aerobic Bacteria: Bacteria that will live and reproduce only in an environment containing oxygen that is available for their respiration (breathing), namely atmospheric oxygen or oxygen dissolved in water.

Aerobic Digestion: The breakdown of wastes by microorganisms in the presence of dissolved oxygen.

Alkalinity: The capacity of water to neutralize acids; a property imparted by carbonates, bicarbonates, hydroxides, and occasionally borates, silicates, and phosphates. It is expressed in milligrams of equivalent calcium carbonate per liter (mg/L CaCO₃).

Anaerobic Bacteria: Bacteria that live and reproduce in an environment containing no "free" or dissolved oxygen. Anaerobic bacteria obtain their oxygen supply by breaking down chemical compounds, which contain oxygen, such as sulfate (SO₄⁼).

Anaerobic Digestion: Wastewater solids and water (about 5% solids, 95% water) are placed in a large tank where bacteria decompose the solids in the absence of dissolved oxygen.

Bacteria: Bacteria are living organisms, microscopic in size, which consist of a single cell. Most bacteria utilize organic matter for their food and produce waste products as the result of their life processes.

BOD: Biochemical Oxygen Demand. The rate at which microorganisms use the oxygen in water or wastewater while stabilizing decomposable organic matter under aerobic conditions. In decomposition, organic matter serves as food for the bacteria and energy results from its oxidation.

Biomass: A mass or clump of living organisms feeding on the wastes in wastewater,

dead organisms and other debris. This mass may be formed for, or function as, the protection against predators and storage of food supplies.

Biomonitoring: A term used to describe methods of evaluating or measuring the effects of toxic substances in effluents on aquatic organisms in receiving waters. The bioassay is a method of estimating the toxic effects of wastes and wastewaters using viable organisms under controlled conditions. These measured effects can be either acute (causing death) or chronic (sublethal, such as growth or reproduction effects).

Biosolids: A term used to describe the primarily organic solid product, produced by wastewater treatment processes, that can be beneficially recycled. Beneficial recycling includes land application to improve soil characteristics, heat and energy recovery, and production of useful products. Biosolids must meet certain government specified criteria depending on its use (e.g., fertilizer or soil amendment).

CBOD: Carbonaceous Biochemical Oxygen Demand. That portion of the biochemical oxygen demand that is due to carbon-containing compounds. This is often used for compliance monitoring as a more realistic estimation of the demand on the receiving water.

Chloramines: Chloramines are compounds formed by the reaction of chlorine with ammonia.

Chlorination: The application of chlorine to water or wastewater, generally for the purpose of disinfection, but frequently for accomplishing other biological or chemical results. In many cases, sodium hypochlorite solution is used as a safer alternative to chlorine gas.

Clarifier: Settling Tank, Sedimentation Basin. A tank or basin in which wastewater is held for a period of time, during which the heavier solids settle to the bottom and the lighter material will float to the water surface.

Coliform: One type of bacteria. The presence of Coliform-group bacteria is an indication of possible pathogenic bacterial contamination. The human intestinal tract is one of the main habitats of Coliform bacteria. Fecal coliforms are those coliforms found in the feces of various warm-blooded animals: whereas the term "Coliform" also includes other environmental sources.

Collection system: In wastewater, a system of conduits, typically underground pipes, that receive and convey sanitary wastewater or storm water.

DO: Dissolved Oxygen. DO is the molecular (atmospheric) oxygen dissolved in water or wastewater.

Dechlorination: The removal of chlorine from the effluent of a treatment plant. Sodium bisulfite solution is primarily used for this purpose.

Detention Time: The time required to fill a tank at a given flow or the theoretical time required for a given flow of wastewater to pass through a tank.

Effluent: Wastewater or other liquid, partially or completely treated or in its natural state, flowing out of a reservoir, basin, treatment plant, or industrial treatment plan.

F/M Ratio: Food to Microorganism Ratio. The ratio between food (from primary effluent) and microorganisms (bacteria) in the aeration basins.

Filamentous Bacteria: Organisms that grow in a thread or filamentous form. A common cause of sludge bulking in the activated sludge process. Common types are thiothrix and actinomyces.

Floc: Groups or clumps of bacteria and particles that have come together and formed a cluster. Found in aeration tanks and secondary clarifiers.

Force Main: A pipe that conveys wastewater or water under pressure from the discharge side of a pump to a point of gravity flow.

Grit: The heavy material present in wastewater, such as sand, eggshells, gravel, and cinders.

Hardness: A characteristic of water imparted primarily by salts of calcium and magnesium (such as bicarbonates, carbonates, sulfates, chlorides and nitrates) that causes curdling and increased consumption of soap, deposition of scale in boilers, damage in some industrial processes, and sometimes objectionable taste. It may be determined by a standard laboratory titration procedure or computed from the amounts of calcium and magnesium expressed as equivalent calcium carbonate (mg/L CaCO₃).

Hydraulic Loading: Hydraulic loading refers to the flows to a treatment plant or treatment process. Detention time, surface loading and weir overflow rate are directly influenced by flows.

Hydrogen sulfide (H₂S): A toxic and lethal gas produced in sewers and digesters by anaerobic decomposition. It is detectable in low concentrations by its characteristic rotten-egg odor. It deadens the sense of smell in higher concentrations or after prolonged exposure.

Impeller: A rotating set of vanes in a pump designed to pump or lift water/wastewater.

I and I: Inflow and Infiltration. Inflow is the water discharged into the sewer system from sources other than regular connections. This includes flow from yard drains and foundation drains. Infiltration is the seepage of groundwater into a sewer system; seepage frequently occurs through defective or cracked pipes, pipe joints, connections or manhole walls.

Influent: Wastewater or other liquid – raw or partially treated – flowing into a reservoir, basin, treatment process, or treatment plant.

MCRT: Mean Cell Residence Time. An expression of the average time that a microorganism will spend in the activated sludge process.

Microorganisms: Very small organisms that can be seen only through a microscope. Some microorganisms use the wastes in wastewater for food and thus remove or alter much of the undesirable matter.

µg/L: Micrograms Per Liter. A measure of the concentration by weight of a substance per unit volume. One µg/L is equal to 1 part per billion. Metals and organic compounds are often measured in µg/L.

mg/L: Milligrams Per Liter. A measure of the concentration by weight of a substance per unit volume. One mg/L is equal to 1 part per million.

Mixed Liquor: When the activated sludge in an aeration tank is mixed with primary effluent or the raw wastewater and return sludge, this mixture is then referred to as mixed liquor as long as it is in the aeration tank. Mixed liquor also may refer to the contents of mixed aerobic or anaerobic digesters.

ng/L: Nanograms Per Liter. A measure of the concentration by weight of a substance per unit volume. One mg/L is equal to 1 part per trillion. Some extremely toxic compounds are measured at this level.

NPDES Permit: National Pollutant Discharge Elimination System permit is the regulatory agency document issued by either a federal or state agency which is designed to control all discharges of pollutants from point sources into U.S. waterways.

Nitrification: An aerobic process in which bacteria change the ammonia and organic nitrogen in wastewater in oxidized nitrogen (usually nitrate).

Nutrients: Substances, which are required to support living plants and organisms. Major nutrients are carbon, hydrogen, oxygen, sulfur, nitrogen and phosphorus.

Organic Waste: Waste material, which comes mainly from animal or plant sources. Bacteria and other small organisms generally can consume organic waste.

Organism: Any form of animal or plant life. Also see BACTERIA.

POTW: Publicly Owned Treatment Works. A treatment works which is owned by a state, municipality, city, town, special sewer district or other publicly owned and financed entity.

Pathogenic Organisms: Bacteria, viruses or cysts, which can cause disease. There are many types of bacteria which do NOT cause disease and that are NOT called pathogenic.

pH: A measure of the hydrogen ion concentration in a solution, expressed as the logarithm (base ten) of the reciprocal of the hydrogen ion concentration in gram moles per liter (g/mole/L). On the pH scale (0 to 14), a value of 7 at 25 degrees Centigrade represents a neutral condition. Decreasing values indicate increasing hydrogen ion concentration (acidity); increasing values indicate decreasing hydrogen ion concentration (alkalinity).

Polymer: A chemical formed by the union of many monomers (a molecule of low molecular weight). Polymers are used with other chemical coagulants to aid in binding small-suspended particles to larger chemical flocs for their removal from water.

Potable Water: Water that does not contain objectionable pollution, contamination, minerals, or infective agents and is considered safe for domestic consumption.

Primary Treatment: A wastewater treatment process that takes place in rectangular or circular tank and allows those substances in wastewater that readily settle or float to be separated from the water being treated.

Raw Wastewater: Plant influent or wastewater before any treatment.

Receiving Waters: A stream, river, lake, ocean, or other surface or groundwaters into which treated or untreated wastewater is discharged.

Return Activated Sludge (RAS): Sludge that is returned to the beginning of the aeration process from the bottom of the secondary clarifiers. Return sludge contains organic solids and live microbes. The microbes feed on the organic material that is contained in the primary effluent.

Secondary Treatment: A wastewater treatment process used to convert dissolved or suspended materials into a form more readily separated from the water being treated. Usually the process follows primary treatment by sedimentation.

Sedimentation: A process in which wastewater is held for a period of time in a tank or basin, during which the heavier solids settle to the bottom.

Settleable Matter: That matter in wastewater that will not stay in suspension during a preselected settling period but settles to the bottom. This is typically measured in the Imhoff cone test, the volume of matter that settles to the bottom of the cone in 1 hour. Suspended solids are mostly removed by conventional sedimentation.

Sludge: The settleable solids separated from liquids during processing or the deposits of foreign materials on the bottoms of streams or other bodies of water.

Suspended Matter: Solids that either float on the surface of, or are in suspension in, water, wastewater, or other liquids, and which are largely removable by laboratory filtering.

Turbidity: A condition in water or wastewater caused by the presence of suspended matter and resulting in the scattering and absorption of light. The analytical quantity is typically reported in turbidity units and determined by the measurement of light scattering using an instrument called a nephelometer.

Volute: The spiral-shaped casing which surrounds a pump, blower, or turbine impeller and collects the liquid or gas discharged by the impeller.

Waste Activated Sludge (WAS): The excess biological solids in the activated sludge inventory, which because of reproduction of the active microorganisms, are no longer required for the activated sludge process. Waste Activated Sludge is typically taken from the settled sludge at the bottom of the Secondary Clarifiers.

Wastewater: The used water and solids from a community that flow to a treatment

plant. Storm water, surface water, and groundwater infiltration also may be included in the wastewater that enters a plant. The term "sewage" usually refers to household wastes, but this word is being replaced by the term "wastewater."

Water Hammer: The sound like someone hammering on a pipe that occurs when a valve is opened or closed very rapidly. When a valve position is changed quickly, the water pressure in a pipe will increase and decrease back and forth very quickly. This rise and fall in pressures can do serious damage to the system.

Weir: A wall or plate placed in an open channel and used to measure the flow. The depth of the flow over the weir can be used to calculate the flow rate, or a chart or conversion table may be used. It can also be a wall or obstruction used to control flow (from clarifiers) to assure uniform flow and avoid short-circuiting.

Wet Well: A compartment or tank in which wastewater is collected. The suction pipe of a pump may be connected to the wet well or a submersible pump may be located in the wet well.

Zoogleal Mass: Jelly-like masses of bacteria found in, both the trickling filter and activated sludge processes. The masses may be formed for or function as the protection against predators and for storage of food supplies. Also see BIOMASS.