APPENDIX E: GLOSSARY OF WASTEWATER TERMS

ABS — ABS

Alkyl Benzene Sulfonate. A type of surfactant, or surface active agent, present in synthetic detergents in the United States before 1965. ABS was especially troublesome because it caused foaming and related breakdown by biological treatment processes. ABS has been replaced in detergents by linear alkyl sulfonate (LAS) which is biodegradable.

ABSORPTION (ab-SORP-shun) — ABSORPTION

Taking in or soaking up of one substance into the body of another by molecular or chemical action (as tree roots absorb dissolved nutrients in the soil).

ACID — ACID

(1) A substance that tends to lose a proton. (2) A substance that dissolves in water with the formation of hydrogen ions. (3) A substance containing hydrogen which may be replaced by metals to form salts.

ACIDITY — ACIDITY

The capacity of water or wastewater to neutralize bases. Acidity is expressed in milligrams per liter of equivalent calcium carbonate. Acidity is not the same as pH because water does not have to be strongly acidic (low pH) to have a high acidity. Acidity is a measure of how much base can be added to a liquid without causing a great change in pH.

ACTIVATED SLUDGE (ACK-ta-VATE-ed slug) — ACTIVATED SLUDGE

Sludge particles produced in raw or settled wastewater (primary effluent) by the growth of organisms (including zoogleal 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 which can feed on the incoming wastewater.

ACTIVATED SLUDGE PROCESS (ACK-ta-VATE-ed slug) — ACTIVATED SLUDGE PROCESS

A biological wastewater treatment process which 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 (returned to the aeration tank) as needed. The remaining wastewater then undergoes more treatment.

ADSORPTION (add-SORP-shun) — ADSORPTION

The gathering of a gas, liquid, or dissolved substance on the surface or interface zone of another substance.

ADVANCED WASTE TREATMENT — ADVANCED WASTE TREATMENT

Any process of water renovation that upgrades treated wastewater to meet specific reuse requirements. May include general cleanup of water or removal of specific parts of wastes insufficiently removed by conventional treatment processes. Typical processes include chemical treatment and pressure filtration. Also called TERTIARY TREATMENT.

AERATION (air-A-shun) — 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.

AERATION LIQUOR (air-A-shun) — AERATION LIQUOR

Mixed liquor. The contents of the aeration tank including living organisms and material carried into the tank by either untreated wastewater or primary effluent.

AERATION TANK (air-A-shun) — AERATION TANK

The tank where raw or settled wastewater is mixed with return sludge and aerated. The same as aeration bay, aerator, or reactor.

AEROBES

Bacteria that must have molecular (dissolved) oxygen (DO) to survive. Aerobes are aerobic bacteria.

AEROBIC (AIR-O-bick)

A condition in which "free" or dissolved oxygen is present in the aquatic environment.

AEROBIC BACTERIA (AIR-O-bick back-TEAR-e-ah)

Bacteria which will live and reproduce only in an environment containing oxygen which is available for their respiration (breathing), namely atmospheric oxygen or oxygen dissolved in water. Oxygen combined chemically, such as in water molecules (H_2O), cannot be used for respiration by aerobic bacteria.

AEROBIC DECOMPOSITION (AIR-O-bick)

The decay or breaking down of organic material in the presence of "free" or dissolved oxygen.

AEROBIC DIGESTION (AIR-O-bick)

The breakdown of wastes by microorganisms in the presence of dissolved oxygen. Waste sludge is placed in a large aerated tank where aerobic microorganisms decompose the organic matter in the sludge. This is an extension of the activated sludge process.

AEROBIC PROCESS (AIR-O-bick)

A waste treatment process conducted under aerobic (in the presence of "free" or dissolved oxygen) conditions.

AGGLOMERATION (a-GLOM-er-A-shun)

The growing or coming together of small scattered particles into larger flocs or particles which settle rapidly. Also see FLOC.

AIR BINDING

The clogging of a filter, pipe or pump due to the presence of air released from water.

AIR GAP

An open vertical drop, or vertical empty space, between a drinking (potable) water supply and the point of use in a wastewater treatment plant. This gap prevents back siphonage because there is no way wastewater can reach the drinking water.

AIR LIFT

A special type of pump. This device consists of a vertical riser pipe submerged in the wastewater or sludge to be pumped. Compressed air is injected into a tail piece at the bottom of the pipe. Fine air bubbles mix with the wastewater or sludge to form a mixture lighter than the surrounding water which causes the mixture to rise in the discharge pipe to the outlet. An airlift pump works similar to the center stand in a percolator coffee pot.

AIR PADDING

Pumping dry air into a container to assist with the withdrawal of a liquid or to force a liquid gas such as chlorine or sulfur dioxide out of a container.

ALGAE (AL-gee)

Microscopic plants which contain chlorophyll and float or are suspended and live in water. They also may be attached to structures, rocks, or other similar substances.

ALIQUOT (AL-li-kwot)

Portion of a sample.

ALKALI

Any of certain soluble salts, principally of sodium, potassium, magnesium, and calcium, that have the property of combining with acids to form neutral salts and may be used in chemical processes such as water or wastewater treatment.

ALKALINITY (AL-ka-LIN-ity)

The capacity of water or wastewater to neutralize acids. This capacity is caused by the water's content of carbonate, bicarbonate, hydroxide, and occasionally borate, silicate, and phosphate. Alkalinity is expressed in milligrams per liter of equivalent calcium carbonate. Alkalinity is not the same as pH because water does not have to be strongly basic (high pH) to have a high alkalinity. Alkalinity is a measure of how much acid can be added to a liquid without causing a great change in pH.

AMBIENT TEMPERATURE (AM-bee-ent) AMBIENT TEMPERATURE

Temperature of the surroundings.

AMPEROMETRIC (am-PURR-o-MET-rick) AMPEROMETRIC

A method of measurement that records electric current flowing or generated, rather than recording voltage. Amperometric titration is a means of measuring concentrations of certain substances in water.

ANAEROBES ANAEROBES

Bacteria that do not need molecular (dissolved) oxygen (DO) to survive.

ANAEROBIC (AN-air-O-bick) ANAEROBIC

A condition in which "free" or dissolved oxygen is *NOT* present in the aquatic environment.

ANAEROBIC BACTERIA (AN-air-O-bick back-TEAR-e-ah) 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 (SO_4).

ANAEROBIC DECOMPOSITION (AN-air-O-bick) ANAEROBIC DECOMPOSITION

The decay or breaking down of organic material in an environment containing no "free" or dissolved oxygen.

ANAEROBIC DIGESTION (AN-air-O-bick) 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. At least two general groups of bacteria act in balance: (1) *SAPROPHYTIC* bacteria break down complex solids to volatile acids, and (2) *METHANE FERMENTERS* break down the acids to methane, carbon dioxide, and water.

ANHYDROUS (an-HI-drous) ANHYDROUS

Very dry. No water or dampness is present.

ANION ANION

A negatively charged ion in an electrolyte solution, attracted to the anode under the influence of electric potential.

ASEPTIC (a-SEP-tick) ASEPTIC

Free from the living germs of disease, fermentation or putrefaction. Sterile.

ASPIRATE (ASS-per-RATE) ASPIRATE

Use of a hydraulic device (aspirator or eductor) to create a negative pressure (suction) by forcing a liquid through a restriction, such as a Venturi. An aspirator (the hydraulic device) may be used in the laboratory in place of a vacuum pump; sometimes used instead of a sump pump.

BOD (BEE-OH-DEE) 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.

BTU (BEE-TEA-YOU) BTU

British Thermal Unit. The amount of heat required to raise the temperature of one pound of water one degree Fahrenheit.

BACTERIA (back-TEAR-e-ah) 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.

BACTERIAL CULTURE (back-TEAR-e-al) BACTERIAL CULTURE

In the case of activated sludge, the bacterial culture refers to the group of bacteria classed as *AEROBES*, and facultative organisms, which covers a wide range of organisms. Most treatment processes in the United States grow facultative organisms which utilize the carbonaceous (carbon compounds) BOD. Facultative organisms can live when oxygen resources are low. When "nitrification" is required, the nitrifying organisms are *OBLIGATE AEROBES* (require oxygen) and must have at least 0.5 mg/L of dissolved oxygen throughout the whole system to function properly.

BAFFLE BAFFLE

A flat board or plate, deflector, guide or similar device constructed or placed in flowing water, wastewater, or slurry systems to cause more uniform flow velocities, to absorb energy, and to divert, guide, or agitate liquids.

BASE BASE

A compound which dissociates in aqueous solution to yield hydroxyl ions.

BATCH PROCESS BATCH PROCESS

A treatment process in which a tank or reactor is filled, the water is treated, and the tank is emptied. The tank may then be filled and the process repeated.

BIOASSAY (BUY-o-ass-SAY) BIOASSAY

(1) A way of showing or measuring the effect of biological treatment on a particular substance or waste, or (2) a method of determining toxic effects of industrial wastes or other wastes by using live organisms such as fish for test organisms.

BIOCHEMICAL OXYGEN DEMAND (BOD) BIOCHEMICAL OXYGEN DEMAND (BOD)

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.

BIOCHEMICAL OXYGEN DEMAND (BOD) TEST BIOCHEMICAL OXYGEN DEMAND (BOD) TEST

A procedure that measures the rate of oxygen use under controlled conditions of time and temperature. Standard test conditions include dark incubation at 20°C for a specified time (usually five days).

BIODEGRADABLE (BUY-o-dee-GRADE-able) BIODEGRADABLE

Organic matter that can be broken down by bacteria to more stable forms which will not create a nuisance or give off foul odors.

BIODEGRADATION (BUY-o-de-grah-DAY-shun) BIODEGRADATION

The breakdown of organic matter by bacteria to more stable forms which will not create a nuisance or give off foul odors.

BIOFLOCCULATION (BUY-o-flock-u-LAY-shun) BIOFLOCCULATION

The clumping together of fine, dispersed organic particles by the action of certain bacteria and algae. This results in faster and more complete settling of the organic solids in wastewater.

BIOMASS (BUY-o-MASS) 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. Also see ZOOGLEAL MASS.

BLANK BLANK

A bottle containing only dilution water or distilled water, but the sample being tested is not added. Tests are frequently run on a *SAMPLE* and a *BLANK* and the differences compared.

BLINDING BLINDING

The clogging of the filtering medium of a microscreen or a vacuum filter when the holes or spaces in the media become sealed off due to grease or the material being filtered.

BOUND WATER BOUND WATER

Water contained within the cell mass of sludges or strongly held on the surface of colloidal particles.

BREAKOUT OF CHLORINE BREAKOUT OF CHLORINE

A point at which chlorine leaves solution as a gas because the chlorine feed rate is too high. The solution is saturated and cannot dissolve any more chlorine.

BREAKPOINT CHLORINATION BREAKPOINT CHLORINATION

Addition of chlorine to water or wastewater until the chlorine demand has been satisfied and further additions of chlorine result in a residual that is directly proportional to the amount added beyond the breakpoint.

BUFFER BUFFER

A solution or liquid whose chemical makeup neutralizes acids or bases without a great change in pH.

BUFFER ACTION BUFFER ACTION

The action of certain ions in solution in opposing a change in hydrogen-ion concentration.

BUFFER CAPACITY BUFFER CAPACITY

A measure of the capacity of a solution or liquid to neutralize acids or bases. This is a measure of the capacity of water or wastewater for offering a resistance to changes in pH.

BUFFER SOLUTION BUFFER SOLUTION

A solution containing two or more substances which, in combination, resist any marked change in pH following addition of moderate amounts of either strong acid or base.

BULKING (BULK-ing) BULKING

Clouds of billowing sludge that occur throughout secondary clarifiers and sludge thickeners when the sludge becomes too light and will not settle properly.

CALORIE (KAL-o-ree) CALORIE

The amount of heat required to raise the temperature of one gram of water one degree Celsius.

CARBONACEOUS STAGE (car-bun-NAY-shus) CARBONACEOUS

A stage of decomposition that occurs in biological treatment processes when aerobic bacteria, using dissolved oxygen, change carbon compounds to carbon dioxide. Sometimes referred to as "first-stage BOD" because the microorganisms attack organic or carbon compounds first and nitrogen compounds later. Also see NITRIFICATION STAGE.

CATHODIC PROTECTION (ca-THOD-ick) CATHODIC PROTECTION

An electrical system for prevention of rust, corrosion, and pitting of steel and iron surfaces in contact with water, wastewater or soil.

CATION EXCHANGE CAPACITY CATION EXCHANGE CAPACITY

The ability of a soil or other solid to exchange cations (positive ions such as calcium, Ca^{+2}) with a liquid.

CAVITATION (CAV-i-TAY-shun) CAVITATION

The formation and collapse of a gas pocket or bubble on the blade of an impeller. The collapse of this gas pocket or bubble drives water into the impeller with a terrific force that can cause pitting on the impeller surface.

CENTRATE CENTRATE

The water leaving a centrifuge after most of the solids have been removed.

CENTRIFUGE CENTRIFUGE

A mechanical device that uses centrifugal or rotational forces to separate solids from liquids.

CHEMICAL EQUIVALENT CHEMICAL EQUIVALENT

The weight in grams of a substance that combines with or displaces one gram of hydrogen. Chemical equivalents usually are found by dividing the formula weight by its valence.

CHEMICAL OXYGEN DEMAND or COD CHEMICAL OXYGEN DEMAND or COD

A measure of the oxygen-consuming capacity of inorganic and organic matter present in wastewater. COD is expressed as the amount of oxygen consumed from a chemical oxidant in mg/*L* during a specific test. Results are not necessarily related to the biochemical oxygen demand because the chemical oxidant may react with substances that bacteria do not stabilize.

CHEMICAL PRECIPITATION CHEMICAL PRECIPITATION

(1) Precipitation induced by addition of chemicals. (2) The process of softening water by the addition of lime or lime and soda ash as the precipitants.

CHLORAMINES (KLOR-a-means) CHLORAMINES

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

CHLORINATION (KLOR-i-NAY-shun) CHLORINATION

The application of chlorine to water or wastewater, generally for the purpose of disinfection, but frequently for accomplishing other biological or chemical results.

CHLORINE DEMAND CHLORINE DEMAND

Chlorine demand is the difference between the amount of chlorine added to wastewater and the amount of residual chlorine remaining after a given contact time. Chlorine demand may change with dosage, time, temperature, pH, and nature and amount of the impurities in the water.

Chlorine Demand, mg/*L* = Chlorine Applied, mg/*L* − Chlorine Residual, mg/*L*

CHLORINE REQUIREMENT CHLORINE REQUIREMENT

The amount of chlorine which is needed for a particular purpose. Some reasons for adding chlorine are reducing the number of coliform bacteria (Most Probable Number), obtaining a particular chlorine residual, or destroying some chemical in the water. In each case a definite dosage of chlorine will be necessary. This dosage is the chlorine requirement.

CHLORORGANIC (chloro-or-GAN-nick) CHLORORGANIC

Chlororganic compounds are organic compounds combined with chlorine. These compounds generally originate from, or are associated with, living or dead organic materials.

CILIATES (SILLY-ates) CILIATES

A class of protozoans distinguished by short hairs on all or part of their bodies.

CLARIFICATION (KLAIR-i-fi-KAY-shun) CLARIFICATION

Any process or combination of processes the main purpose of which is to reduce the concentration of suspended matter in a liquid.

CLARIFIER (KLAIR-i-fire) 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.

COAGULANT AID COAGULANT AID

Any chemical or substance used to assist or modify coagulation.

COAGULANTS (co-AGG-you-lents) COAGULANTS

Chemicals that cause very fine particles to clump together into larger particles. This makes it easier to separate the solids from the liquids by settling, skimming, draining or filtering.

COAGULATION (co-AGG-you-LAY-shun) COAGULATION

The use of chemicals that cause very fine particles to clump together into larger particles. This makes it easier to separate the solids from the liquids by settling, skimming, draining or filtering.

COLIFORM (COAL-i-form) 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. They may also be found in the intestinal tracts of warm-blooded animals, and in plants, soil, air, and the aquatic environment. Fecal coliforms are those coliforms found in the feces of various warm-blooded animals; whereas the term "coliform" also includes other environmental sources.

COLLOIDS (KOL-loids) COLLOIDS

Very small, finely divided solids (particles that do not dissolve) that remain dispersed in a liquid for a long time due to their small size and electrical charge.

COLORIMETRIC MEASUREMENT COLORIMETRIC MEASUREMENT

A means of measuring unknown concentrations of water quality indicators in a sample by measuring the sample's color intensity. The color of the sample after the addition of specific chemicals (reagents) is compared with colors of known concentrations.

COMBINED AVAILABLE CHLORINE COMBINED AVAILABLE CHLORINE

The concentration of chlorine which is combined with ammonia (NH_3) as chloramine or as other chloro derivatives, yet is still available to oxidize organic matter.

COMBINED AVAILABLE RESIDUAL CHLORINE COMBINED AVAILABLE RESIDUAL CHLORINE

That portion of the total residual chlorine which remains in water or wastewater at the end of a specified contact period and reacts chemically and biologically as chloramines or organic chloramines.

COMBINED RESIDUAL CHLORINATION COMBINED RESIDUAL CHLORINATION

The application of chlorine to water or wastewater to produce a combined chlorine residual. The residual may consist of chlorine compounds formed by the reaction of chlorine with natural or added ammonia (NH_3) or with certain organic nitrogen compounds.

COMBINED SEWER COMBINED SEWER

A sewer designed to carry both sanitary wastewaters and storm- or surface-water runoff.

COMMINUTION (com-mi-NEW-shun) COMMINUTION

Shredding. A mechanical treatment process which cuts large pieces of wastes into smaller pieces so they won't plug pipes or damage equipment. *COMMINUTION* and *SHREDDING* usually mean the same thing.

COMMINUTOR (com-mi-NEW-ter) COMMINUTOR

A device used to reduce the size of the solid chunks in wastewater by shredding (comminuting). The shredding action is like many scissors cutting or chopping to shreds all the large influent solids material.

COMPOSITE (PROPORTIONAL) SAMPLE (com-POZ-it) COMPOSITE (PROPORTIONAL) SAMPLE

A composite sample is a collection of individual samples obtained at regular intervals, usually every one or two hours during a 24-hour time span. Each individual sample is combined with the others in proportion to the flow when the sample was collected. The resulting mixture (composite sample) forms a representative sample and is analyzed to determine the average conditions during the sampling period.

COMPOUND COMPOUND

A pure substance composed of two or more elements whose composition is constant. For example, table salt (sodium chloride - Na Cl) is a compound.

CONING (CONE-ing) CONING

Development of a cone-shaped flow of liquid, like a whirlpool, through sludge. This can occur in a sludge hopper during sludge withdrawal when the sludge becomes too thick. Part of the sludge remains in place while liquid rather than sludge flows out of the hopper. Also called "coring."

CONTACT STABILIZATION CONTACT STABILIZATION

Contact stabilization is a modification of the conventional activated sludge process. In contact stabilization, two aeration tanks are used. One tank is for separate re-aeration of the return sludge for at least four hours before it is permitted to flow into the other aeration tank to be mixed with the primary effluent requiring treatment.

CONTINUOUS PROCESS CONTINUOUS PROCESS

A treatment process in which water is treated continuously in a tank or reactor. The water being treated continuously flows into the tank at one end, is treated as it flows through the tank, and flows out the opposite end as treated water.

CONVENTIONAL TREATMENT CONVENTIONAL TREATMENT

The pretreatment, sedimentation, flotation, trickling filter, activated sludge and chlorination wastewater treatment processes.

CROSS CONNECTION CROSS CONNECTION

A connection between drinking (potable) water and an unsafe water supply. For example, if you have a pump moving nonpotable water and hook into the drinking water system to supply water for the pump seal, a cross connection or mixing between the two water systems can occur. This mixing may lead to contamination of the drinking water.

CRYOGENIC (cry-o-JEN-nick) CRYOGENIC

Low temperature.

DO (DEE-OH) DO

Abbreviation of Dissolved Oxygen. DO is the atmospheric oxygen dissolved in water or wastewater.

DATEOMETER (day-TOM-uh-ter) DATEOMETER

A small calendar disc attached to motors and equipment to indicate the year in which the last maintenance service was performed.

DECHLORINATION (dee-KLOR-i-NAY-shun) DECHLORINATION

The removal of chlorine from the effluent of a treatment plant.

DECIBEL DECIBEL

A unit for expressing the relative intensity of sounds on a scale from zero for the average least perceptible sound to about 130 for the average pain level.

DECOMPOSITION, DECAY DECOMPOSITION, DECAY

Processes that convert unstable materials into more stable forms by chemical or biological action. Waste treatment encourages decay in a controlled situation so that material may be disposed of in a stable form. When organic matter decays under anaerobic conditions (putrefaction), undesirable odors are produced. The aerobic processes in common use for wastewater treatment produce much less objectional odors.

DEGRADATION (de-grah-DAY-shun) DEGRADATION

The conversion of a substance to simpler compounds. For example, the degradation of organic matter to carbon dioxide and water.

DENITRIFICATION DENITRIFICATION

A condition that occurs when nitrite or nitrate ions are reduced to nitrogen gas and bubbles are formed as a result of this process. The bubbles attach to the biological flocs and float the flocs to the surface of the secondary clarifiers. This condition is often the cause of rising sludge observed in secondary clarifiers.

DENSITY (DEN-sit-tee) DENSITY

A measure of how heavy a substance (solid, liquid or gas) is for its size. Density is expressed in terms of weight per unit volume, that is, grams per cubic centimeter or pounds per cubic foot. The density of water (at 4°C or 39°F) is 1.0 gram per cubic centimeter or about 62.4 pounds per cubic foot.

DESICCATOR (DESS-i-KAY-tor) DESICCATOR

A closed container into which heated weighing or drying dishes are placed to cool in a dry environment. The dishes may be empty or they may contain a sample. Desiccators contain a substance, such as anhydrous calcium chloride, which absorbs moisture and keeps the relative humidity near zero so that the dish or sample will not gain weight from absorbed moisture.

DETENTION TIME 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.

DETRITUS (dee-TRI-tus) DETRITUS

The heavy, coarse mixture of grit and organic material carried by wastewater.

DEW POINT DEW POINT

The temperature to which air with a given quantity of water vapor must be cooled to cause condensation of the vapor in the air.

DEWATER DEWATER

To remove or separate a portion of the water present in a sludge or slurry.

DEWATERABLE DEWATERABLE

This is a property of a sludge related to the ability to separate the liquid portion from the solid, with or without chemical conditioning. A material is considered dewaterable if water will readily drain from it.

DIAPHRAGM PUMP DIAPHRAGM PUMP

The pump in which a flexible diaphragm, generally of rubber or equally flexible material, is the operating part. It is fastened at the edges in a vertical cylinder. When the diaphragm is raised suction is exerted, and when it is depressed, the liquid is forced through a discharge valve.

DIFFUSED-AIR AERATION DIFFUSED-AIR AERATION

A diffused air activated sludge plant takes air, compresses it, and then discharges the air below the water surface of the aerator through some type of air diffusion device.

DIFFUSER DIFFUSER

A device (porous plate, tube, bag) used to break the air stream from the blower system into fine bubbles in an aeration tank or reactor.

DIGESTER (die-JEST-er) DIGESTER

A tank in which sludge is placed to allow decomposition by microorganisms. Digestion may occur under anaerobic (more common) or aerobic conditions.

DISCHARGE HEAD DISCHARGE HEAD

The pressure (in feet (meters) or pounds per square inch (kilograms per square centimeter)) on the discharge side of a pump. The pressure can be measured from the center line of the pump to the hydraulic grade line of the water in the discharge pipe.

DISINFECTION (dis-in-FECT-shun) DISINFECTION

The process designed to kill most microorganisms in wastewater, including essentially all pathogenic (disease-causing) bacteria. There are several ways to disinfect, with chlorine being most frequently used in water and wastewater treatment plants. Compare with STERILIZATION.

DISSOLVED OXYGEN DISSOLVED OXYGEN

Molecular oxygen dissolved in water or wastewater, usually abbreviated DO.

DISTILLATE (DIS-tuh-late) DISTILLATE

In the distillation of a sample, a portion is evaporated; the part that is condensed afterwards is the distillate.

DISTRIBUTOR DISTRIBUTOR

The rotating mechanism that distributes the wastewater evenly over the surface of a trickling filter or other process unit. Also see FIXED SPRAY NOZZLE.

DOCTOR BLADE DOCTOR BLADE

A blade used to remove any excess solids that may cling to the outside of a rotating screen.

DROOP DROOP

The difference between the actual value and the desired value (or set point) characteristics of proportional controllers that do not incorporate reset action. Also called OFFSET.

DYNAMIC HEAD DYNAMIC HEAD

When a pump is operating, the vertical distance (in feet or meters) from a point to the energy grade lines. Also see TOTAL DYNAMIC HEAD and STATIC HEAD.

EDUCTOR (e-DUCK-tor) EDUCTOR

A hydraulic device used to create a negative pressure (suction) by forcing a liquid through a restriction, such as a Venturi. An eductor or aspirator (the hydraulic device) may be used in the laboratory in place of a vacuum pump; sometimes used instead of a suction pump.

EFFLORESCENCE (EF-low-RESS-ense) EFFLORESCENCE

The powder or crust formed on a substance when moisture is given off upon exposure to the atmosphere.

EFFLUENT (EF-lu-ent) EFFLUENT

Wastewater or other liquid — raw, partially or completely treated — flowing *FROM* a basin, treatment process, or treatment plant.

ELECTRO-CHEMICAL PROCESS ELECTRO-CHEMICAL PROCESS

A process that causes the deposition or formation of a seal or coating of a chemical element or compound by the use of electricity.

ELECTRO-MAGNETIC FORCES ELECTRO-MAGNETIC FORCES

Forces resulting from electrical charges that either attract or repel particles. Particles with opposite charges are attracted to each other. For example, a particle with positive charges is attracted to a particle with negative charges. Particles with similar charges repel each other. A particle with positive charges is repelled by a particle with positive charges and a particle with negative charges is repelled by another particle with negative charges.

ELECTROLYSIS (ELECT-TROLLEY-sis) ELECTROLYSIS

The decomposition of material by an electric current.

ELECTROLYTE (ELECT-tro-LIGHT) ELECTROLYTE

A substance which dissociates (separates) into two or more ions when it is dissolved in water.

ELECTROLYTIC PROCESS (ELECT-tro-LIT-ick) ELECTROLYTIC PROCESS

A process that causes the decomposition of a chemical compound by the use of electricity.

ELECTRON ELECTRON

An extremely small (microscopic), negatively charged particle. An electron is much too small to be seen with a microscope.

ELEMENT ELEMENT

A substance which cannot be separated into substances of other kinds by ordinary chemical means. For example, sodium (Na) is an element.

ELUTRIATION (e-LOO-tree-A-shun) ELUTRIATION

The washing of digested sludge in plant effluent. The objective is to remove (wash out) fine particulates and/or alkalinity in sludge. This process reduces the demand for conditioning chemicals and improves settling or filtering characteristics of the solids.

EMULSION (e-MULL-shun) EMULSION

A liquid mixture of two or more liquid substances not normally dissolved in one another, but one liquid held in suspension in the other.

END POINT END POINT

Samples are titrated to the end point. This means that a chemical is added, drop by drop, to a sample until a certain color change (blue to clear, for example) occurs which is called the *END POINT* of the titration. In addition to a color change, an end point may be reached by the formation of a precipitate or the reaching of a specified pH. An end point may be detected by the use of an electronic device such as a pH meter.

ENDOGENOUS (en-DODGE-en-us) ENDOGENOUS

A reduced level of respiration (breathing) in which organisms break down compounds within their own cells to produce the oxygen they need.

ENERGY GRADE LINE (EGL) ENERGY GRADE LINE (EGL)

A line that represents the elevation of energy head (in feet) of water flowing in a pipe, conduit or channel. The line is drawn above the hydraulic grade line a distance equal to the velocity head of the water flowing at each section or point along the pipe or channel.

ENTERIC ENTERIC

Intestinal.

ENZYMES (EN-zimes) ENZYMES

Enzymes are organic substances which are produced by living organisms and speed up chemical changes.

EQUALIZING BASIN EQUALIZING BASIN

A holding basin in which variations in flow and composition of liquid are averaged. Such basins are used to provide a flow of reasonably uniform volume and composition to a treatment unit. Also called a balancing reservoir.

ESTUARIES (ES-chew-wear-eez) ESTUARIES

Bodies of water which are located at the lower end of a river and are subject to tidal fluctuations.

EVAPOTRANSPIRATION (e-VAP-o-trans-spi-RAY-shun) EVAPOTRANSPIRATION

The total water removed from an area by transpiration (plants) and by evaporation from soil, snow and water surfaces.

EXPLOSIMETER EXPLOSIMETER

An instrument used to detect explosive atmospheres. When the Lower Explosive Limit (L.E.L.) of an atmosphere is exceeded, an alarm signal on the instrument is activated.

F/M RATIO F/M RATIO

Food to microorganism ratio. A measure of food provided to bacteria in an aeration tank.

$$\frac{\text{Food}}{\text{Microorganisms}} = \frac{\text{BOD, lbs/day}}{\text{MLVSS, lbs}}$$

$$= \frac{\text{Flow, MGD} \times \text{BOD, mg/L} \times 8.34\ \text{lbs/gal}}{\text{Volume, MG} \times \text{MLVSS, mg/L} \times 8.34\ \text{lbs/gal}}$$

$$\text{or} \quad = \frac{\text{BOD, kg/day}}{\text{MLVSS, kg}}$$

FACULTATIVE (FACK-ul-TAY-tive) FACULTATIVE

Facultative bacteria can use either molecular (dissolved) oxygen or oxygen obtained from food materials such as sulfate or nitrate ions. In other words, facultative bacteria can live under aerobic or anaerobic conditions.

FACULTATIVE POND (FACK-ul-TAY-tive) FACULTATIVE POND

The most common type of pond in current use. The upper portion (supernatant) is aerobic, while the bottom layer is anaerobic. Algae supply most of the oxygen to the supernatant.

FILAMENTOUS BACTERIA (FILL-a-MEN-tuss) FILAMENTOUS BACTERIA

Organisms that grow in a thread or filamentous form. Common types are thiothrix and actinomycetes.

FILTER AID FILTER AID

A chemical (usually a polymer) added to water to help remove fine colloidal suspended solids.

FIXED FIXED

A sample is "fixed" in the field by adding chemicals that prevent the water quality indicators of interest in the sample from changing before final measurements are performed later in the lab.

FIXED SPRAY NOZZLE FIXED SPRAY NOZZLE

Cone-shaped spray nozzle used to distribute wastewater over the filter media, similar to a lawn sprinkling system. A deflector or steel ball is mounted within the cone to spread the flow of wastewater through the cone, thus causing a spraying action. Also see DISTRIBUTOR.

FLAME POLISHED

Melted by a flame to smooth out irregularities. Sharp or broken edges of glass (such as the end of a glass tube) are rotated in a flame until the edge melts slightly and becomes smooth.

FLIGHTS

Scraper boards, made from redwood or other rot-resistant woods or plastic, used to collect and move settled sludge or floating scum.

FLOC

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

FLOCCULATION (FLOCK-you-LAY-shun)

The gathering together of fine particles to form larger particles.

FLOW-EQUALIZATION SYSTEM

A device or tank designed to hold back or store a portion of peak flows for release during low-flow periods.

FOOD/MICROORGANISM RATIO

Food to microorganism ratio. A measure of food provided to bacteria in an aeration tank.

$$\frac{\text{Food}}{\text{Microorganisms}} = \frac{\text{BOD, lbs/day}}{\text{MLVSS, lbs}}$$

$$= \frac{\text{Flow, MGD} \times \text{BOD, mg/L} \times 8.34 \text{ lbs/gal}}{\text{Volume, MG} \times \text{MLVSS, mg/L} \times 8.34 \text{ lbs/gal}}$$

$$\text{or} \quad = \frac{\text{BOD, kg/day}}{\text{MLVSS, kg}}$$

Commonly abbreviated F/M Ratio.

FORCE MAIN

A pipe that conveys wastewater under pressure from the discharge side of a pump to a point of gravity flow.

FREE AVAILABLE CHLORINE

The amount of chlorine available in water. This chlorine may be in the form of dissolved gas (Cl_2), hypochlorous acid (HOCl), or hypochlorite ion (OCl^-), but does not include chlorine combined with an amine (ammonia or nitrogen) or other organic compound.

FREE AVAILABLE RESIDUAL CHLORINE

That portion of the total residual chlorine remaining in water or wastewater at the end of a specified contact period. Residual chlorine will react chemically and biologically as hypochlorous acid (HOCl) or hypochlorite ion (OCl^-).

FREE CHLORINE

Free chlorine is chlorine (Cl_2) in a liquid or gaseous form. Free chlorine combines with water to form hypochlorous (HOCl) and hydrochloric (HCl) acids. In wastewater free chlorine usually combines with an amine (ammonia or nitrogen) or other organic compounds to form combined chlorine compounds.

FREE OXYGEN

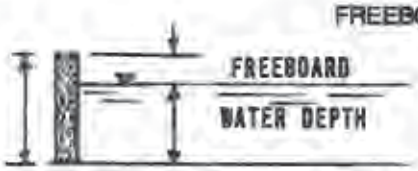
Molecular oxygen available for respiration by organisms. Molecular oxygen is the oxygen molecule, O_2, that is not combined with another element to form a compound.

FREE RESIDUAL CHLORINATION

The application of chlorine or chlorine compounds to water or wastewater to produce a free available chlorine residual directly or through the destruction of ammonia (NH_3) or certain organic nitrogenous compounds.

FREEBOARD

The vertical distance from the normal water surface to the top of the confining wall.



FRICTION LOSS

The head lost by water flowing in a stream or conduit as the result of the disturbances set up by the contact between the moving water and its containing conduit and by intermolecular friction.

GASIFICATION (GAS-I-fi-KAY-shun) GASIFICATION

The conversion of soluble and suspended organic materials into gas during anaerobic decomposition. In clarifiers the resulting gas bubbles can become attached to the settled sludge and cause large clumps of sludge to rise and float on the water surface. In anaerobic sludge digesters, this gas is collected for fuel or disposed of using the waste gas burner.

GRAB SAMPLE GRAB SAMPLE

A single sample of wastewater taken at neither a set time nor flow.

GRAVIMETRIC GRAVIMETRIC

A means of measuring unknown concentrations of water quality indicators in a sample by *WEIGHING* a precipitate or residue of the sample.

GRIT GRIT

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

GRIT REMOVAL GRIT REMOVAL

Grit removal is accomplished by providing an enlarged channel or chamber which causes the flow velocity to be reduced and allows the heavier grit to settle to the bottom of the channel where it can be removed.

GROWTH RATE GROWTH RATE

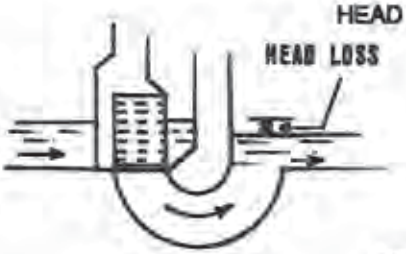
An experimentally determined constant to estimate the unit growth rate of bacteria while degrading organic wastes.

HEAD HEAD

A term used to describe the height or energy of water above a point. A head of water may be measured in either height (feet or meters) or pressure (pounds per square inch or kilograms per square centimeter). Also see DISCHARGE HEAD, DYNAMIC HEAD, STATIC HEAD, SUCTION HEAD, SUCTION LIFT and VELOCITY HEAD.

HEAD LOSS HEAD LOSS

An indirect measure of loss of energy or pressure. Flowing water will lose some of its energy when it passes through a pipe, bar screen, comminutor, filter or other obstruction. The amount of energy or pressure lost is called "head loss." Head loss is measured as the difference in elevation between the upstream water surface and the downstream water surface and may be expressed in feet or meters.



HEADER HEADER

A large pipe to which the ends of a series of smaller pipes are connected. Also called a "manifold."

HEADWORKS HEADWORKS

The facilities where wastewater enters a wastewater treatment plant. The headworks may consist of bar screens, comminutors, a wet well and pumps.

HEPATITIS HEPATITIS

Hepatitis is an acute viral infection of the liver. Yellow jaundice is one symptom of hepatitis.

HUMUS SLUDGE HUMUS SLUDGE

The sloughed particles of biomass from trickling filter media that are removed from the water being treated in secondary clarifiers.

HYDRAULIC GRADE LINE (HGL) HYDRAULIC GRADE LINE (HGL)

The surface or profile of water flowing in an open channel or a pipe flowing partially full. If a pipe is under pressure, the hydraulic grade line is at the level water would rise to in a small tube connected to the pipe. To reduce the release of odors from wastewater, the water surface should be kept as smooth as possible.

HYDRAULIC LOADING HYDRAULIC LOADING

Hydraulic loading refers to the flows (MGD or cu m/day) to a treatment plant or treatment process. Detention times, surface loadings and weir overflow rates are directly influenced by flows.

HYDROGEN ION CONCENTRATION (H^+) HYDROGEN ION CONCENTRATION (H^+)

The weight of hydrogen ion in moles per liter of solution. Commonly expressed as the pH value, which is the logarithm of the reciprocal of the hydrogen-ion concentration.

$$pH = \log \frac{1}{(H^+)}$$

HYDROGEN SULFIDE (H_2S) HYDROGEN SULFIDE (H_2S)

Hydrogen sulfide is a gas with a rotten egg odor. This gas is produced under anaerobic conditions. Hydrogen sulfide is particularly dangerous because it dulls your sense of smell so that you don't notice it after you have been around it for a while and because the odor is not noticeable in high concentrations. The gas is very poisonous to your respiratory system, explosive, flammable and colorless.

HYDROLOGIC CYCLE (HI-dro-loj-ic) HYDROLOGIC CYCLE

The process of evaporation of water into the air and its return to earth by precipitation (rain or snow). This process also includes transpiration from plants, groundwater movement and runoff into rivers, streams and the ocean.

HYDROLYSIS (hi-DROL-e-sis) HYDROLYSIS

The addition of water to the molecule to break down complex substances into simpler ones.

HYDROSTATIC SYSTEM HYDROSTATIC SYSTEM

In a hydrostatic sludge removal system, the surface of the water in the clarifier is higher than the surface of the water in the sludge well or hopper. This difference in pressure head forces sludge from the bottom of the clarifier to flow through pipes to the sludge well or hopper.

HYGROSCOPIC (HI-grow-SKOP-ic) HYGROSCOPIC

A substance that absorbs or attracts moisture from the air.

HYPOCHLORINATION (hi-po-KLOR-i-NAY-shun) HYPOCHLORINATION

The application of hypochlorite compounds to water or wastewater for the purpose of disinfection.

HYPOCHLORINATORS (hi-poe-KLOR-i-NAY-tors) HYPOCHLORINATORS

Chlorine pumps or devices used to feed chlorine solutions made from hypochlorites such as bleach (sodium hypochlorite) or calcium hypochlorite.

HYPOCHLORITE (hi-po-KLOR-ite) HYPOCHLORITE

Hypochlorite compounds contain chlorine and are used for disinfection. They are available as liquids or solids (powder, granules, and pellets) in barrels, drums, and cans.

IMHOFF CONE IMHOFF CONE

A clear, cone-shaped container marked with graduations. The cone is used to measure the volume of settleable solids in a specific volume of wastewater.

IMPELLER IMPELLER

A rotating set of vanes designed to impel rotation of a mass of fluid.

IMPELLER PUMP IMPELLER PUMP

Any pump in which the water is moved by the continuous application of power from some mechanical source.

INCINERATION INCINERATION

The conversion of dewatered sludge cake by combustion (burning) to ash, carbon dioxide and water vapor.

INDICATOR (CHEMICAL) INDICATOR (CHEMICAL)

A substance that gives a visible change, usually of color, at a desired point in a chemical reaction, generally at a specified end point.

INDOLE (IN-dole) INDOLE

An organic compound (C_8H_7N) containing nitrogen which has an ammonia odor.

INFILTRATION (IN-fil-TRAY-shun) INFILTRATION

The seepage of groundwater into a sewer system, including service connections. Seepage frequently occurs through defective or cracked pipes, pipe joints, connections or manhole walls.

INFLOW INFLOW

Water discharged into the sewer system from sources other than regular connections. This includes flow from yard drains, foundation drains and around manhole covers. Inflow differs from infiltration in that it is a direct discharge into the sewer rather than a leak in the sewer itself.

INFLUENT (IN-flu-ent) INFLUENT

Wastewater or other liquid — raw or partially treated — flowing *INTO* a reservoir, basin, treatment process, or treatment plant.

INHIBITORY SUBSTANCES INHIBITORY SUBSTANCES

Materials that kill or restrict the ability of organisms to treat wastes.

INOCULATE (in-NOCK-you-late) INOCULATE

To introduce a seed culture into a system.

INORGANIC WASTE INORGANIC WASTE

Waste material such as sand, salt, iron, calcium, and other mineral materials which are only slightly affected by the action of organisms. Inorganic wastes are chemical substances of mineral origin; whereas organic wastes are chemical substances usually of animal or plant origin. Also see NONVOLATILE MATTER.

INTERFACE INTERFACE

The common boundary layer between two fluids such as a gas (air) and a liquid (water) or a liquid (water) and another liquid (oil).

IONIC CONCENTRATION IONIC CONCENTRATION

The concentration of any ion in solution, generally expressed in moles per liter.

IONIZATION IONIZATION

The process of adding electrons to, or removing electrons from, atoms or molecules, thereby creating ions. High temperatures, electrical discharges, and nuclear radiation can cause ionization.

JAR TEST JAR TEST

A laboratory procedure that simulates coagulation/flocculation with differing chemical doses. The purpose of the procedure is to *ESTIMATE* the minimum coagulant dose required to achieve certain water quality goals. Samples of water to be treated are placed in six jars. Various amounts of chemicals are added to each jar, stirred and the settling of solids is observed. The lowest dose of chemicals that provides satisfactory settling is the dose used to treat the water.

JOULE (jewel) JOULE

A measure of energy, work or quantity of heat. One joule is the work done when the point of application of a force of one newton is displaced a distance of one meter in the direction of the force.

KJELDAHL NITROGEN (KELL-doll) KJELDAHL NITROGEN

Organic and ammonia nitrogen.

LAUNDERS (LAWN-ders) LAUNDERS

Sedimentation tank effluent troughs.

LIMIT SWITCH LIMIT SWITCH

A device that regulates or controls the travel distance of a chain or cable.

LINEAL (LIN-e-al) LINEAL

The length in one direction of a line. For example, a board 12 feet long has 12 lineal feet in its length.

LIQUEFACTION (LICK-we-FACK-shun) LIQUEFACTION

The conversion of large solid particles of sludge into very fine particles which either dissolve or remain suspended in wastewater.

LOADING LOADING

Quantity of material applied to a device at one time.

M or MOLAR M or MOLAR

A molar solution consists of one gram molecular weight of a compound dissolved in enough water to make one liter of solution. A gram molecular weight is the molecular weight of a compound in grams. For example, the molecular weight of sulfuric acid (H_2SO_4) is 98. A 1*M* solution of sulfuric acid would consist of 98 grams of H_2SO_4 dissolved in enough distilled water to make one liter of solution.

MBAS MBAS

Methylene Blue Active Substance. Another name for surfactants, or surface active agents, is methylene blue active substances. The determination of surfactants is accomplished by measuring the color change in a standard solution of methylene blue dye.

MPN (EM-PEA-EN) MPN

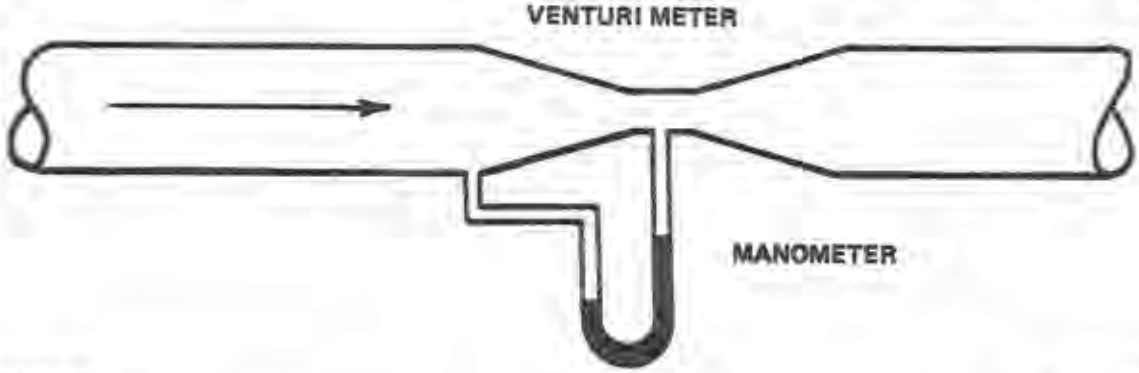
MPN is the Most Probable Number of coliform-group organisms per unit volume. Expressed as a density or population of organisms per 100 ml.

MANIFOLD

A large pipe to which the ends of a series of smaller pipes are connected. Also called a "header."

MANOMETER (man-NAH-met-ter)

An instrument for measuring pressure. Usually a glass tube filled with a liquid and used to measure the difference in pressure across a flow-measuring device such as an orifice or Venturi meter. The instrument used to measure blood pressure is a type of manometer.



MASKING AGENTS

Substances used to cover up or disguise unpleasant odors. Liquid masking agents are dripped into the wastewater, sprayed into the air, or evaporated (using heat) with the unpleasant fumes or odors and then discharged into the air by blowers to make an undesirable odor less noticeable.

MEAN CELL RESIDENCE TIME (MCRT)

An expression of the average time that a microorganism will spend in the activated sludge process.

$$\text{MCRT, days} = \frac{\text{Solids in Activated Sludge Process, lbs}}{\text{Solids Removed from Process, lbs/day}}$$

MECHANICAL AERATION

The use of machinery to mix air and water so that oxygen can be absorbed into the water. Some examples are: paddle wheels, mixers, or rotating brushes to agitate the surface of an aeration tank; pumps to create fountains; and pumps to discharge water down a series of steps forming falls or cascades.

MEDIA

The material in a trickling filter on which slime organisms grow. As settled wastewater trickles over the media, slime organisms remove certain types of wastes thereby partially treating the wastewater. Also the material in a rotating biological contactor or in a gravity or pressure filter.

MEDIAN

The middle measurement or value. When several measurements are ranked by magnitude (largest to smallest), half of the measurements will be larger and half will be smaller.

MENISCUS (meh-NIS-cuss)

The curved top of a column of liquid (water, oil, mercury) in a small tube. When the liquid wets the sides of the container (as with water), the curve forms a valley. When the confining sides are not wetted (as with mercury), the curve forms a hill or upward bulge.

MERCAPTANS (mer-CAP-tans)

Compounds containing sulfur which have an extremely offensive skunk odor.

MESOPHILIC BACTERIA (mess-O-FILL-lick)

Medium temperature bacteria. A group of bacteria that grow and thrive in a moderate temperature range between 68°F (20°C) and 113°F (45°C). The optimum temperature range for these bacteria in anaerobic digestion is 85°F (30°C) to 100°F (38°C).

MICRON (MY-kron) MICRON

A unit of length. One millionth of a meter or one thousandth of a millimeter. One micron equals 0.00004 of an inch.

MICROORGANISMS (micro-ORGAN-is-sums) 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.

MICROSCREEN MICROSCREEN

A device with a fabric straining media with openings usually between 20 and 60 microns. The fabric is wrapped around the outside of a rotating drum. Wastewater enters the open end of the drum and flows out through the rotating screen cloth. At the highest point of the drum the collected solids are backwashed by high-pressure water jets into a trough located within the drum.

MILLIGRAMS PER LITER, mg/L (MILL-I-GRAMS per LEET-er) MILLIGRAMS PER LITER, mg/L

A measure of the concentration by weight of a substance per unit volume. For practical purposes, one mg/L is equal to one part per million parts (ppm). Thus a liter of water with a specific gravity of 1.0 weighs one million milligrams; and if it contains 10 milligrams of dissolved oxygen, the concentration is 10 milligrams per million milligrams, or 10 milligrams per liter (10 mg/L), or 10 parts of oxygen per million parts of water, or 10 parts per million (10 ppm).

MILLIMICRON (MILL-e-MY-cron) MILLIMICRON

One thousandth of a micron or a millionth of a millimeter.

MIXED LIQUOR 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.

MIXED LIQUOR SUSPENDED SOLIDS (MLSS) MIXED LIQUOR SUSPENDED SOLIDS(MLSS)

Suspended solids in the mixed liquor of an aeration tank.

MIXED LIQUOR VOLATILE SUSPENDED SOLIDS (MLVSS) MIXED LIQUOR VOLATILE SUSPENDED SOLIDS (MLVSS)

The organic or volatile suspended solids in the mixed liquor of an aeration tank.

MOLECULAR OXYGEN MOLECULAR OXYGEN

The oxygen molecule, O_2, that is not combined with another element to form a compound.

MOLECULAR WEIGHT MOLECULAR WEIGHT

The molecular weight of a compound in grams is the sum of the atomic weights of the elements in the compound. The molecular weight of sulfuric acid (H_2SO_4) in grams is 98.

Element	Atomic Weight	Number of Atoms	Molecular Weight
H	1	2	2
S	32	1	32
O	16	4	64
			98

MOLECULE (MOLL-uh-kule) MOLECULE

A molecule is the smallest portion of an element or compound that still retains or exhibits all the properties of the substance.

MOTILE (MO-till) MOTILE

Motile organisms exhibit or are capable of movement.

MOVING AVERAGE MOVING AVERAGE

To calculate the moving average for the last 7 days, add up values for the last 7 days and divide by 7. Each day add the most recent day to the sum of values and subtract the oldest value. By using the 7-day moving average, each day of the week is always represented in the calculations.

MUFFLE FURNACE MUFFLE FURNACE

A small oven capable of reaching temperatures up to 600°C. Muffle furnaces are used in laboratories for burning or incinerating samples to determine the amounts of volatile solids and/or fixed solids in samples of wastewater.

MULTI-STAGE PUMP MULTI-STAGE PUMP

A pump that has more than one impeller. A single-stage pump has one impeller.

N or NORMAL N or NORMAL

A normal solution contains one gram equivalent weight of a reactant (compound) per liter of solution. The equivalent weight of an acid is that weight which contains one gram atom of ionizable hydrogen or its chemical equivalent. For example, the equivalent weight of sulfuric acid (H_2SO_4) is 49 (98 divided by 2 because there are two replaceable hydrogen ions). A 1 *N* solution of sulfuric acid would consist of 49 grams of H_2SO_4 dissolved in enough water to make one liter of solution.

NPDES PERMIT NPDES PERMIT

National Pollutant Discharge Elimination System permit is the regulatory agency document designed to control all discharges of pollutants from point sources into U.S. waterways. NPDES permits regulate discharges into navigable waters from all point sources of pollution, including industries, municipal treatment plants, large agricultural feed lots and return irrigation flows.

NEUTRALIZATION (new-trall-i-ZAY-shun) NEUTRALIZATION

Addition of an acid or alkali (base) to a liquid to cause the pH of the liquid to move towards a neutral pH of 7.0.

NITRIFICATION (NYE-tri-fi-KAY-shun) NITRIFICATION

A process in which bacteria change the ammonia and organic nitrogen in wastewater into oxidized nitrogen (usually nitrate). The second-stage BOD is sometimes referred to as the "nitrification stage" (first-stage BOD is called the "carbonaceous stage").

NITRIFYING BACTERIA NITRIFYING BACTERIA

Bacteria that change the ammonia and organic nitrogen in wastewater into oxidized nitrogen (usually nitrate).

NITROGENOUS (nye-TROG-en-ous) NITROGENOUS

Nitrogenous compounds contain nitrogen.

NOMOGRAM NOMOGRAM

A chart or diagram containing three or more scales used to solve problems with three or more variables instead of using mathematical formulas.

NONCORRODIBLE NONCORRODIBLE

A material that resists corrosion and will not be eaten away by wastewater or chemicals in wastewater.

NONSPARKING TOOLS NONSPARKING TOOLS

These tools will not produce a spark during use.

NONVOLATILE MATTER NONVOLATILE MATTER

Material such as sand, salt, iron, calcium, and other mineral materials which are only slightly affected by the action of organisms. Volatile materials are chemical substances usually of animal or vegetable origin. Also see INORGANIC WASTE.

NUTRIENT CYCLE NUTRIENT CYCLE

The transformation or change of a nutrient from one form to another until the nutrient has returned to the original form, thus completing the cycle. The cycle may take place under either aerobic or anaerobic conditions.

NUTRIENTS NUTRIENTS

Substances which are required to support living plants and organisms. Major nutrients are carbon, hydrogen, oxygen, sulfur, nitrogen and phosphorus. Nitrogen and phosphorus are difficult to remove from wastewater by conventional treatment processes because they are water soluble and tend to recycle. Also see NUTRIENT CYCLE.

O & M MANUAL (Operation and Maintenance Manual) O & M MANUAL

A manual which outlines procedures for operators to follow to operate and maintain a specific wastewater treatment plant and the equipment in the plant.

OSHA OSHA

The Williams-Steiger Occupational Safety and Health Act of 1970 (OSHA) is a law designed to protect the health and safety of industrial workers and treatment plant operators. It regulates the design, construction, operation and maintenance of industrial plants and wastewater treatment plants. The Act does not apply directly to municipalities at present (1980), *EXCEPT* in those states that have approved plans and have asserted jurisdiction under Section 18 of the OSHA Act. However, wastewater treatment plants have come under stricter regulation in all phases of activity as a result of OSHA standards.

OBLIGATE AEROBES OBLIGATE AEROBES

Bacteria that must have molecular (dissolved) oxygen (DO) to reproduce.

ODOR PANEL ODOR PANEL

A group of people used to measure odors.

OFFSET OFFSET

The difference between the actual value and the desired value (or set point) characteristic of proportional controllers that do not incorporate reset action. Also called DROOP.

OLFACTOMETER (ol-FACT-tom-meter) OLFACTOMETER

A device used to measure odors in the field by diluting odors with odor-free air.

ORGANIC WASTE ORGANIC WASTE

Waste material which comes mainly from animal or plant sources. Organic waste generally can be consumed by bacteria and other small organisms. Inorganic wastes are chemical substances of mineral origin.

ORGANISM ORGANISM

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

ORIFICE (OR-uh-fiss) ORIFICE

An opening in a plate, wall or partition. In a trickling filter distributor, the wastewater passes through an orifice to the surface of the filter media. An orifice flange set in a pipe consists of a slot or hole smaller than the pipe diameter. The difference in pressure in the pipe above and at the orifice may be related to flow in the pipe.

ORTHOTOLIDINE (or-tho-TOL-i-dine) ORTHOTOLIDINE

Orthotolidine is a colorimetric indicator of chlorine residual. If chlorine is present, a yellow-colored compound is produced. This method is no longer approved for tests of effluent chlorine residual.

OVERFLOW RATE OVERFLOW RATE

One of the guidelines for the design of settling tanks and clarifiers in treatment plants.

$$\text{Overflow Rate, gpd/sq ft} = \frac{\text{Flow, gallons/day}}{\text{Surface Area, sq ft}}$$

OXIDATION (ox-i-DAY-shun) OXIDATION

Oxidation is the addition of oxygen, removal of hydrogen, or the removal of electrons from an element or compound. In wastewater treatment, organic matter is oxidized to more stable substances. The opposite of REDUCTION.

OXIDATION-REDUCTION POTENTIAL OXIDATION-REDUCTION POTENTIAL

The electrical potential required to transfer electrons from one compound or element (the oxidant) to another compound or element (the reductant) and used as a qualitative measure of the state of oxidation in wastewater treatment systems.

OXIDIZED ORGANICS OXIDIZED ORGANICS

Organic materials that have been broken down in a biological process. Examples of these materials are carbohydrates and proteins that are broken down to simple sugars.

OXIDIZING AGENT OXIDIZING AGENT

An oxidizing agent is any substance, such as oxygen (O_2) and chlorine (Cl_2), that can add (take on) electrons. When oxygen or chlorine is added to wastewater, organic substances are oxidized. These oxidized organic substances are more stable and less likely to give off odors or to contain disease bacteria. The opposite of REDUCING AGENT.

OZONIZATION (O-zoe-nie-ZAY-shun) OZONIZATION

The application of ozone to water, wastewater, or air, generally for the purposes of disinfection or odor control.

PACKAGE TREATMENT PLANT PACKAGE TREATMENT PLANT

A small wastewater treatment plant often fabricated at the manufacturer's factory, hauled to the site, and installed as one facility. The package may be either a small primary or a secondary wastewater treatment plant.

PARALLEL OPERATION PARALLEL OPERATION

When wastewater being treated is split and a portion flows to one treatment unit while the remainder flows to another similar treatment unit. Also see SERIES OPERATION.

PARASITIC BACTERIA (PAIR-a-SIT-tick) PARASITIC BACTERIA

Parasitic bacteria are those bacteria which normally live off another living organism, known as the "host."

PATHOGENIC ORGANISMS (path-o-JEN-nick) PATHOGENIC ORGANISMS

Bacteria, viruses or cysts which can cause disease (typhoid, cholera, dysentery). There are many types of bacteria which do *NOT* cause disease and which are *NOT* called pathogenic. Many beneficial bacteria are found in wastewater treatment processes actively cleaning up organic wastes.

PERCENT SATURATION PERCENT SATURATION

The amount of a substance that is dissolved in a solution compared with the amount that could be dissolved in the solution, expressed as a percent.

$$\text{Percent Saturation, \%} = \frac{\text{Amount of Sub. that is Dissolved} \times 100\%}{\text{Amount that Could be Dissolved in Solution}}$$

PERCOLATION (PURR-ko-LAY-shun) PERCOLATION

The movement or flow of water through soil or rocks.

PERISTALTIC PUMP (peri-STALL-tick) PERISTALTIC PUMP

A type of positive displacement pump.

pH (PEA-A-ch) pH

pH is an expression of the intensity of the alkaline or acid condition of a liquid. Mathematically, pH is the logarithm (base 10) of the reciprocal of the hydrogen ion concentration.

$$pH = \text{Log}\ \frac{1}{(H^+)}$$

The pH may range from 0 to 14, where 0 is most acid, 14 most alkaline, and 7 is neutral. Natural waters usually have a pH between 6.5 and 8.5.

PHENOL (FEE-noll) PHENOL

An organic compound that is a derivative of benzene.

PHENOLPHTHALEIN ALKALINITY PHENOLPHTHALEIN ALKALINITY

A measure of the hydroxide ions plus one half of the normal carbonate ions in aqueous suspension. Measured by the amount of sulfuric acid required to bring the water to a pH value of 8.3, as indicated by a change in color of phenolphthalein. It is expressed in milligrams per liter of calcium carbonate.

PHOTOSYNTHESIS (foto-SIN-the-sis) PHOTOSYNTHESIS

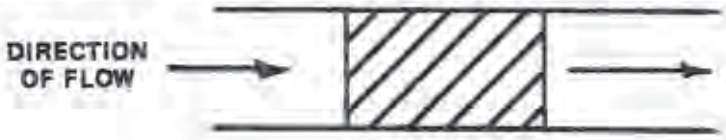
A process in which organisms with the aid of chlorophyll (green plant enzyme) convert carbon dioxide and inorganic substances to oxygen and additional plant material, utilizing sunlight for energy. All green plants grow by this process.

PHYSICAL WASTE TREATMENT PROCESS PHYSICAL WASTE TREATMENT PROCESS

Physical waste treatment processes include use of racks, screens, comminutors, and clarifiers (sedimentation and flotation). Chemical or biological reactions are not an important part of a physical treatment process.

PLUG FLOW PLUG FLOW

A type of flow that occurs in tanks, basins or reactors when a slug of wastewater moves through a tank without ever dispersing or mixing with the rest of the wastewater flowing through the tank.



PLUG FLOW

POLLUTION POLLUTION

Any change in the natural state of water which interferes with its beneficial reuse or causes failure to meet water-quality requirements.

POLYELECTROLYTE (POLY-electro-light) POLYELECTROLYTE

A high-molecular-weight substance that is formed by either a natural or synthetic process. Natural polyelectrolytes may be of biological origin or derived from starch products, cellulose derivatives, and alignates. Synthetic polyelectrolytes consist of simple substances that have been made into complex, high-molecular-weight substances. Often called a "polymer."

POLYMER (POLY-mer) POLYMER

A high-molecular-weight substance that is formed by either a natural or synthetic process. Natural polymers may be of biological origin or derived from starch products, cellulose derivatives, and alignates. Synthetic polymers consist of simple substances that have been made into complex, high-molecular-weight substances. Often called a "polyelectrolyte."

POLYSACCHARIDE (poly-SAC-a-ride) POLYSACCHARIDE

A carbohydrate such as starch, insulin or cellulose.

PONDING PONDING

A condition occurring on trickling filters when the hollow spaces (voids) become plugged to the extent that water passage through the filter is inadequate. Ponding may be the result of excessive slime growths, trash, or media breakdown.

POPULATION EQUIVALENT POPULATION EQUIVALENT

A means of expressing the strength of organic material in wastewater. In a domestic wastewater system, microorganisms use up about 0.2 pounds of oxygen per day for each person using the system (as measured by the standard BOD test).

$$\text{Pop. Equiv., persons} = \frac{\text{Flow, MGD} \times \text{BOD, mg/L} \times 8.34 \text{ lbs/gal}}{0.2 \text{ lbs BOD/day/person}}$$

POSTCHLORINATION POSTCHLORINATION

The addition of chlorine to the plant discharge or effluent, *FOLLOWING* plant treatment, for disinfection purposes.

POTABLE WATER (POE-ta-bl) POTABLE WATER

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

PRE-AERATION PRE-AERATION

The addition of air at the initial stages of treatment to freshen the wastewater, remove gases, add oxygen, promote flotation of grease, and aid coagulation.

PRECHLORINATION PRECHLORINATION

The addition of chlorine at the headworks of the plant *PRIOR TO* other treatment processes mainly for odor and corrosion control. Also applied to aid disinfection, to reduce plant BOD load, to aid in settling, to control foaming in Imhoff units and to help remove oil.

PRECIPITATE (pre-SIP-i-TATE) PRECIPITATE

To separate (a substance) out in solid form from a solution, as by the use of a reagent. The substance precipitated.

PRECOAT PRECOAT

Application of a free-draining, non-cohesive material such as diatomaceous earth to a filtering media. Precoating reduces the frequency of media washing and facilitates cake discharge.

PRETREATMENT PRETREATMENT

The removal of metal, rocks, rags, sand, eggshells, and similar materials which may hinder the operation of a treatment plant. Pretreatment is accomplished by using equipment such as racks, bar screens, comminutors, and grit removal systems.

PRIMARY TREATMENT PRIMARY TREATMENT

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

PROCESS VARIABLE PROCESS VARIABLE

A physical or chemical quantity which is usually measured and controlled.

PROTEINACEOUS (PRO-ten-NAY-shus) PROTEINACEOUS

Materials containing proteins which are organic compounds containing nitrogen.

PROTOZOA (pro-toe-ZOE-ah) PROTOZOA

A group of microscopic animals (usually single-celled) that sometimes cluster into colonies.

PRUSSIAN BLUE PRUSSIAN BLUE

A paste or liquid used to show a contact area. Used to determine if gate valve seats fit properly.

PSYCHROPHILIC BACTERIA (sy-kro-FILL-lick) PSYCHROPHILIC BACTERIA

Cold temperature bacteria. A group of bacteria that grow and thrive in temperatures below 68°F (20°C).

PURGE PURGE

To remove a gas or vapor from a vessel, reactor or confined space.

PUTREFACTION (PEW-tree-FACK-shun) PUTREFACTION

Biological decomposition of organic matter with the production of ill-smelling products associated with anaerobic conditions.

PUTRESCIBLE (pew-TRES-uh-bull) PUTRESCIBLE

Material that will decompose under anaerobic conditions and produce nuisance odors.

PYROMETER (pie-ROM-uh-ter) PYROMETER

An apparatus used to measure high temperatures.

RACK RACK

Evenly spaced parallel metal bars or rods located in the influent channel to remove rags, rocks, and cans from wastewater.

RAW WASTEWATER RAW WASTEWATER

Plant influent or wastewater before any treatment.

REAGENT (re-A-gent) REAGENT

A substance which takes part in a chemical reaction and is used to measure, detect, or examine other substances.

RECALCINE (re-CAL-seen) RECALCINE

A lime-recovery process in which the calcium carbonate in sludge is converted to lime by heating at 1800°F (980°C).

RECARBONATION (re-CAR-bun-NAY-shun) RECARBONATION

A process in which carbon dioxide is bubbled through the water being treated to lower the pH.

RECEIVING WATER RECEIVING WATER

A stream, river, lake or ocean into which treated or untreated wastewater is discharged.

RECHARGE RATE RECHARGE RATE

Rate at which water is added beneath the ground surface to replenish or recharge groundwater.

RECIRCULATION RECIRCULATION

The return of part of the effluent from a treatment process to the incoming flow.

REDUCING AGENT REDUCING AGENT

A reducing agent is any substance, such as the chloride ion (Cl^-) and sulfide ion (S^{-2}), that can give up electrons. The opposite of OXIDIZING AGENT.

REDUCTION (re-DUCK-shun) REDUCTION

Reduction is the addition of hydrogen, removal of oxygen, or the addition of electrons to an element or compound. Under anaerobic conditions in wastewater, sulfate compounds or elemental sulfur are reduced to odor-producing hydrogen sulfide (H_2S) or the sulfide ion (S^{-2}). The opposite of OXIDATION.

RELIQUEFACTION (re-LICK-we-FACK-shun) RELIQUEFACTION

The return of a gas to a liquid. For example, a condensation of chlorine gas returning to the liquid form.

REFRACTORY MATERIALS (re-FRACK-tory) REFRACTORY MATERIALS

Material difficult to remove entirely from wastewater such as nutrients, color, taste- and odor-producing substances and some toxic materials.

REPRESENTATIVE SAMPLE REPRESENTATIVE SAMPLE

A portion of material or water identical in content to that in the larger body of material or water being sampled.

RESIDUAL CHLORINE RESIDUAL CHLORINE

Residual chlorine is the amount of chlorine remaining after a given contact time and under specific conditions.

RESPIRATION RESPIRATION

The process in which an organism uses oxygen for its life processes and gives off carbon dioxide.

RETENTION TIME RETENTION TIME

The time water, sludge or solids are retained or held in a clarifier or sedimentation tank. See DETENTION TIME.

RIPRAP RIPRAP

Broken stones, boulders, or other materials placed compactly or irregularly on levees or dikes for the protection of earth surfaces against the erosive action of waves.

RISING SLUDGE RISING SLUDGE

Rising sludge occurs in the secondary clarifiers of activated sludge plants when the sludge settles to the bottom of the clarifier, is compacted, and then starts to rise to the surface, usually as a result of denitrification.

ROTAMETER ROTAMETER

A device used to measure the flow rate of gases and liquids. The gas or liquid being measured flows vertically up a calibrated tube. Inside the tube is a small ball or a bullet-shaped float (it may rotate) that rises or falls depending on the flow rate. The flow rate may be read on a scale behind the middle of the ball or the top of the float.

ROTARY PUMP ROTARY PUMP

A type of displacement pump consisting essentially of elements rotating in a pump case which they closely fit. The rotation of these elements alternately draws in and discharges the water being pumped. Such pumps act with neither suction nor discharge valves, operate at almost any speed, and do not depend on centrifugal forces to lift the water.

ROTIFERS (ROE-ti-fers) ROTIFERS

Microscopic animals characterized by short hairs on their front end.

SAR (Sodium Adsorption Ratio) SAR

This ratio expresses the relative activity of sodium ions in the exchange reactions with soil. The ratio is defined as follows:

$$SAR = \frac{Na}{[\frac{1}{2}(Ca + Mg)]^{\frac{1}{2}}}$$

where Na, Ca, and Mg are concentrations of the respective ions in milliequivalents per liter of water.

$$Na, meq/L = \frac{Na, mg/L}{23.0\ mg/meq} \qquad Ca, meq/L = \frac{Ca, mg/L}{20.0\ mg/meq}$$

$$Mg, meq/L = \frac{Mg, mg/L}{12.15\ mg/meq}$$

SCFM SCFM

Cubic Feet of air per Minute at Standard conditions of temperature and pressure.

SVI (Sludge Volume Index) SVI

This is a test used to indicate the settling ability of activated sludge (aerated solids) in the secondary clarifier. The test is a measure of the volume of sludge compared with its weight. Allow the sludge sample from the aeration tank to settle for 30 minutes. Then calculate SVI by dividing the volume (ml) of wet settled sludge by the weight (mg) of that sludge after it has been dried. Sludge with an SVI of one hundred or greater will not settle as readily as desirable because it is as light as or lighter than water.

$$SVI = \frac{Wet\ Settled\ Sludge, ml \times 1000}{Dried\ Sludge\ Solids, mg}$$

SANITARY SEWER (SAN-eh-tare-ee SUE-er) SANITARY SEWER

A sewer intended to carry wastewater from homes, businesses, and industries. Storm water runoff should be collected and transported in a separate system of pipes.

SAPROPHYTIC ORGANISMS (SAP-pro-FIT-tik) SAPROPHYTIC ORGANISMS

Organisms living on dead or decaying organic matter. They help natural decomposition of the organic solids in wastewater.

SCREEN SCREEN

A device used to retain or remove suspended or floating objects in wastewater. The screen has openings that are generally uniform in size. It retains or removes objects larger than the openings. A screen may consist of bars, rods, wires, gratings, wire mesh, or perforated plates.

SEALING WATER SEALING WATER

Water used to prevent wastewater or dirt from reaching moving parts. Sealing water is at a higher pressure than the wastewater it is keeping out of a mechanical device.

SECCHI DISC (SECK-key) SECCHI DISC

A flat, white disc lowered into the water by a rope until it is just barely visible. At this point, the depth of the disc from the water surface is the recorded secchi disc reading.

SECONDARY TREATMENT 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. The process commonly is a type of biological treatment process followed by secondary clarifiers that allow the solids to settle out from the water being treated.

SEED SLUDGE SEED SLUDGE

In wastewater treatment, seed, seed culture or seed sludge refers to a mass of sludge which contains very concentrated populations of microorganisms. When a seed sludge is mixed with the wastewater or sludge being treated, the process of biological decomposition takes place more rapidly.

SEIZING SEIZING

Seizing occurs when an engine overheats and a component expands so the engine will not run. Also called "freezing."

SEPTIC (SEP-tick) SEPTIC

This condition is produced by anaerobic bacteria. If severe, the wastewater turns black, gives off foul odors, contains little or no dissolved oxygen and creates a heavy oxygen demand.

SEPTICITY (sep-TIS-it-tee) SEPTICITY

Septicity is the condition in which organic matter decomposes to form foul-smelling products associated with the absence of free oxygen. If severe, the wastewater turns black, gives off foul odors, contains little or no dissolved oxygen and creates a heavy oxygen demand.

SERIES OPERATION SERIES OPERATION

When wastewater being treated flows through one treatment unit and then flows through another similar treatment unit. Also see PARALLEL OPERATION.

SET POINT SET POINT

The position at which the control or controller is set. This is the same as the desired value of the process variable.

SEWAGE SEWAGE

The used water and solids from homes that flow to a treatment plant. The preferred term is wastewater.

SHEAR PIN SHEAR PIN

A straight pin with a groove around the middle that will weaken the pin and cause it to fail when a certain load or stress is exceeded. The purpose of the pin is to protect equipment from damage due to excessive loads or stresses.

SHOCK LOAD SHOCK LOAD

The arrival at a plant of a waste which is toxic to organisms in sufficient quantity or strength to cause operating problems. Possible problems include odors and sloughing off of the growth or slime on the trickling-filter media. Organic or hydraulic overloads also can cause a shock load.

SHORT-CIRCUITING SHORT-CIRCUITING

A condition that occurs in tanks or ponds when some of the water or wastewater travels faster than the rest of the flowing water.

SHREDDING SHREDDING

Comminution. A mechanical treatment process which cuts large pieces of wastes into smaller pieces so they won't plug pipes or damage equipment. *SHREDDING* and *COMMINUTION* usually mean the same thing.

SIDESTREAM SIDESTREAM

Wastewater flows that develop from other storage or treatment facilities. This wastewater may or may not need additional treatment.

SIGNIFICANT FIGURE SIGNIFICANT FIGURE

The number of accurate numbers in a measurement. If the distance between two points is measured to the nearest hundredth and recorded as 238.41 feet, the measurement has five significant figures.

SINGLE-STAGE PUMP SINGLE-STAGE PUMP

A pump that has only one impeller. A multi-stage pump has more than one impeller.

SKATOLE (SKATE-tole) SKATOLE

An organic compound (C_9H_9N) containing nitrogen which has a fecal odor.

SLAKE SLAKE

To become mixed with water so that a true chemical reaction takes place, such as in the slaking of lime.

SLOUGHINGS (SLUFF-ings) SLOUGHINGS

Trickling-filter slimes that have been washed off the filter media. They are generally quite high in BOD and will lower effluent quality unless removed.

SLUDGE (sluj) 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.

SLUDGE AGE SLUDGE AGE

A measure of the length of time a particle of suspended solids has been undergoing aeration in the activated sludge process.

$$\text{Sludge Age, days} = \frac{\text{Suspended Solids Under Aeration, lbs or kg}}{\text{Suspended Solids Added, lbs/day or kg/day}}$$

SLUDGE DENSITY INDEX (SDI) SLUDGE DENSITY INDEX (SDI)

This test is used in a way similar to the Sludge Volume Index (SVI) to indicate the settleability of a sludge in a secondary clarifier or effluent. SDI = 100/SVI. Also see SLUDGE VOLUME INDEX (SVI).

SLUDGE DIGESTION SLUDGE DIGESTION

The process of changing organic matter in sludge into a gas or a liquid or a more stable solid form. These changes take place as microorganisms feed on sludge in anaerobic (more common) or aerobic digesters.

SLUDGE GASIFICATION SLUDGE GASIFICATION

A process in which soluble and suspended organic matter are converted into gas by anaerobic decomposition. The resulting gas bubbles can become attached to the settled sludge and cause large clumps of sludge to rise and float on the water surface.

SLUDGE VOLUME INDEX (SVI) SLUDGE VOLUME INDEX (SVI)

This is a test used to indicate the settling ability of activated sludge (aerated solids) in the secondary clarifier. The test is a measure of the volume of sludge compared with its weight. Allow the sludge sample from the aeration tank to settle for 30 minutes. Then calculate SVI by dividing the volume (ml) of wet settled sludge by the weight (mg) of that sludge after it has been dried. Sludge with an SVI of one hundred or greater will not settle as readily as desirable because it is as light as or lighter than water.

$$\text{SVI} = \frac{\text{Wet Settled Sludge, ml} \times 1000}{\text{Dried Sludge Solids, mg}}$$

SLUDGE-VOLUME RATIO (SVR) SLUDGE-VOLUME RATIO (SVR)

The volume of sludge blanket divided by the daily volume of sludge pumped from the thickener.

SLUGS SLUGS

Intermittent releases or discharges of industrial wastes.

SLURRY (SLUR-e) SLURRY

A thin watery mud or any substance resembling it (such as a grit slurry or a lime slurry).

SODIUM ADSORPTION RATIO (SAR) SODIUM ABSORPTION RATIO (SAR)

This ratio expresses the relative activity of sodium ions in the exchange reactions with soil. The ratio is defined as follows:

$$\text{SAR} = \frac{\text{Na}}{[\tfrac{1}{2}(\text{Ca} + \text{Mg})]^{1/2}}$$

where Na, Ca, and Mg are concentrations of the respective ions in milliequivalents per liter of water.

$$\text{Na, meq/L} = \frac{\text{Na, mg/L}}{23.0\ \text{mg/meq}} \qquad \text{Ca, meq/L} = \frac{\text{Ca, mg/L}}{20.0\ \text{mg/meq}}$$

$$\text{Mg, meq/L} = \frac{\text{Mg, mg/L}}{12.15\ \text{mg/meq}}$$

SOLUBLE BOD SOLUBLE BOD

Soluble BOD is the BOD of water that has been filtered in the standard suspended solids test.

SOLUTE

SOLUTE

The substance dissolved in a solution. A solution is made up of the solvent and the solute.

SOLUTION

SOLUTION

A liquid mixture of dissolved substances. In a solution it is impossible to see all the separate parts.

SPECIFIC GRAVITY

SPECIFIC GRAVITY

Weight of a particle or substance in relation to the weight of water. Water has a specific gravity of 1.000 at 4°C (or 39°F). Wastewater particles usually have a specific gravity of 0.5 to 2.5.

SPLASH PAD

SPLASH PAD

A structure made of concrete or other durable material to protect bare soil from erosion by splashing or falling water.

STABILIZE

STABILIZE

To convert to a form that resists change. Organic material is stabilized by bacteria which convert the material to gases and other relatively inert substances. Stabilized organic material generally will not give off obnoxious odors.

STABILIZED WASTE

STABILIZED WASTE

A waste that has been treated or decomposed to the extent that, if discharged or released, its rate and state of decomposition would be such that the waste would not cause a nuisance or odors.

STANDARD SOLUTION

STANDARD SOLUTION

A solution in which the exact concentration of a chemical or compound is known.

STANDARDIZE

STANDARDIZE

(1) To compare with a standard. In wet chemistry, to find out the exact strength of a solution by comparing with a standard of known strength. This information is used to adjust the strength by adding more water or more of the substance dissolved. (2) To compare an instrument or device with a standard. This helps you to adjust the instrument so that it reads accurately or to prepare a scale, graph or chart that is accurate.

STASIS (STAY-sis)

STASIS

Stagnation or inactivity of the life processes within organisms.

STATIC HEAD

STATIC HEAD

When water is not moving, the distance (in feet or meters) from a point to the water surface.

STATOR

STATOR

That portion of a machine which contains the stationary (non-moving) parts that surround the moving parts.

STEP-FEED AERATION

STEP-FEED AERATION

Step-feed aeration is a modification of the conventional activated sludge process. In step aeration, primary effluent enters the aeration tank at several points along the length of the tank, rather than all of the primary effluent entering at the beginning or head of the tank and flowing through the entire tank.

STERILIZATION (ster-uh-luh-ZAY-shun)

STERILIZATION

The removal or destruction of all living microorganisms, including pathogenic and saprophytic bacteria, vegetative forms and spores. Compare with DISINFECTION.

STETHOSCOPE

STETHOSCOPE

An instrument used to magnify sounds and convey them to the ear.

STOP LOG

STOP LOG

A log or board in an outlet box or device used to control the water level in ponds.

STORM SEWER

STORM SEWER

A separate sewer that carries runoff from storms, surface drainage, and street wash, but does not include domestic and industrial wastes.

STRIPPED GASES

STRIPPED GASES

Gases that are released from a liquid by bubbling air through the liquid or by allowing the liquid to be sprayed or tumbled over media.

STRIPPED ODORS STRIPPED ODORS

Odors that are released from a liquid by bubbling air through the liquid or by allowing the liquid to be sprayed and/or tumbled over media.

STUCK STUCK

Not working. A stuck digester does not decompose organic matter properly. The digester is characterized by low gas production, high volatile acid to alkalinity relationship, and poor liquid-solids separation. A digester in a stuck condition is sometimes called a "sour" or "upset" digester.

SUCTION HEAD SUCTION HEAD

The pressure (in feet (meters) or pounds per square inch (kilograms per square centimeter)) on the suction side of a pump. The pressure can be measured from the center line of the pump *UP TO* the elevation of the hydraulic grade line on the suction side of the pump.

SUCTION LIFT SUCTION LIFT

The *NEGATIVE* pressure (in feet (meters) or inches (centimeters) of mercury vacuum) on the suction side of the pump. The pressure can be measured from the center line of the pump *DOWN TO* the elevation of the hydraulic grade line on the suction side of the pump.

SUPERNATANT (sue-per-NAY-tent) SUPERNATANT

Liquid removed from settled sludge. Supernatant commonly refers to the liquid between the sludge on the bottom and the scum on the surface of an anaerobic digester. This liquid is usually returned to the influent wet well or to the primary clarifier.

SURFACE LOADING SURFACE LOADING

Surface loading is calculated by dividing the flow into a sedimentation tank or a clarifier by the surface area of the unit.

$$\text{Surface Loading, gpd/sq ft} = \frac{\text{Flow, gpd}}{\text{Surface Area, sq ft}}$$

SURFACTANT SURFACTANT

Abbreviation for surface-active agent. The active agent in detergents that possesses a high cleaning ability.

SUSPENDED SOLIDS SUSPENDED SOLIDS

(1) 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. (2) The quantity of material removed from wastewater in a laboratory test, as prescribed in *STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER* and referred to as nonfilterable residue.

TOC TOC

Total Organic Carbon. TOC measures the amount of organic carbon in water.

TERTIARY TREATMENT (TER-she-AIR-ee) TERTIARY TREATMENT

Any process of water renovation that upgrades treated wastewater to meet specific reuse requirements. May include general cleanup of water or removal of specific parts of wastes insufficiently removed by conventional treatment processes. Typical processes include chemical treatment and pressure filtration. Also called ADVANCED WASTE TREATMENT.

THERMOPHILIC BACTERIA (thermo-FILL-lick) THERMOPHILIC BACTERIA

Hot temperature bacteria. A group of bacteria that grow and thrive in temperatures above 113°F (45°C). The optimum temperature range for these bacteria in anaerobic decomposition is 120°F (49°C) to 135°F (57°C).

THIEF HOLE THIEF HOLE

A digester sampling well.

THRESHOLD ODOR THRESHOLD ODOR

The minimum odor of a sample (gas or water) that can just be detected after successive odorless (gas or water) dilutions.

TIME LAG TIME LAG

The time required for processes and control systems to respond to a signal or to reach a desired level.

TITRATE (TIE-trate) TITRATE

To *TITRATE* a sample, a chemical solution of known strength is added on a drop-by-drop basis until a color change, precipitate, or pH change in the sample is observed (end point). Titration is the process of adding the chemical solution to completion of the reaction as signaled by the end point.

TOTAL DYNAMIC HEAD (TDH) TOTAL DYNAMIC HEAD (TDH)

When a pump is lifting or pumping water, the vertical distance (in feet or meters) from the elevation of the energy grade line on the suction side of the pump to the elevation of the energy grade line on the discharge side of the pump.

TOTAL RESIDUAL CHLORINE TOTAL RESIDUAL CHLORINE

The amount of chlorine remaining after a given contact time. The sum of the combined available residual chlorine and the free available residual chlorine. Also see RESIDUAL CHLORINE.

TOTALIZER TOTALIZER

A device that continuously sums or adds the flow into a plant in gallons or million gallons or some other unit of measurement.

TOXIC (TOX-ick) TOXIC

Poisonous.

TOXICITY (tox-IS-it-tee) TOXICITY

A condition which may exist in wastes and will inhibit or destroy the growth or function of certain organisms.

TRANSPIRATION (TRAN-speer-RAY-shun) TRANSPIRATION

The process by which water vapor is lost to the atmosphere from living plants.

TRICKLING FILTER TRICKLING FILTER

A treatment process in which the wastewater trickles over media that provide the opportunity for the formation of slimes or biomass which contain organisms that feed upon and remove wastes from the water treated.

TRICKLING-FILTER MEDIA TRICKLING-FILTER MEDIA

Rocks or other durable materials that make up the body of the filter. Synthetic (manufactured) media have been used successfully.

TRUNK SEWER TRUNK SEWER

A sewer that receives wastewater from many tributary branches or sewers and serves a large territory and contributing population.

TURBID TURBID

Having a cloudy or muddy appearance.

TURBIDITY METER TURBIDITY METER

An instrument for measuring the amount of particles suspended in water. Precise measurements are made by measuring how light is scattered by the suspended particles. The normal measuring range is 0 to 100 and is expressed as Nephelometric Turbidity Units (NTU's).

TURBIDITY UNITS TURBIDITY UNITS

Turbidity units, if measured by nephelometric (reflected light) instrumental procedure, are expressed in nephelometric turbidity units (NTU). Those turbidity units obtained by other instrumental methods or visual methods are expressed in Jackson Turbidity Units (JTU) and sometimes as Formazin Turbidity Units (FTU). The FTU nomenclature comes from the Formazin polymer used to prepare the turbidity standards for instrument calibration. Turbidity units are a measure of the cloudiness of water.

TWO-STAGE FILTERS TWO-STAGE FILTERS

Two filters are used. Effluent from the first filter goes to the second filter, either directly or after passing through a clarifier.

ULTRAFILTRATION ULTRAFILTRATION

A membrane filtration process used for the removal of organic compounds in an aqueous (watery) solution.

UPSET UPSET

An upset digester does not decompose organic matter properly. The digester is characterized by low gas production, high volatile acid/alkalinity relationship, and poor liquid-solids separation. A digester in an upset condition is sometimes called a "sour" or "stuck" digester.

VELOCITY HEAD VELOCITY HEAD

A vertical height (in feet or meters) equal to the square of the velocity of flowing water divided by twice the acceleration due to gravity ($V^2/2g$).

VOLATILE (VOL-a-til) VOLATILE

A volatile substance is one that is capable of being evaporated or changed to a vapor at relatively low temperatures.

VOLATILE ACIDS VOLATILE ACIDS

Acids produced during digestion. Fatty acids which are soluble in water and can be steam-distilled at atmospheric pressure. Also called "organic acids." Volatile acids are commonly reported as equivalent to acetic acid.

VOLATILE LIQUIDS VOLATILE LIQUIDS

Liquids which easily vaporize or evaporate at room temperature.

VOLATILE SOLIDS VOLATILE SOLIDS

Those solids in water, wastewater, or other liquids that are lost on ignition of the dry solids at 550°C.

VOLUMETRIC VOLUMETRIC

A means of measuring unknown concentrations of water quality indicators in a sample *BY DETERMINING THE VOLUME* of titrant or liquid reagent needed to complete particular reactions.

VOLUTE (vol-LOOT) VOLUTE

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

WASTEWATER 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 WATER HAMMER

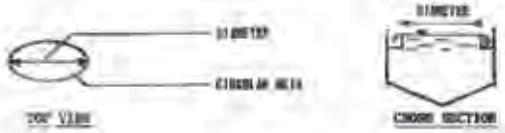
The sound like someone hammering on a pipe that occurs when a valve is opened or closed very rapidly. When a valve position is changed quickly, the water pressure in a pipe will increase and decrease back and forth very quickly. This rise and fall in pressures can do serious damage to the system.

WEIR (weer) WEIR

(1) 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. (2) A wall or obstruction used to control flow (from clarifiers) to assure uniform flow and avoid short-circuiting.

WEIR DIAMETER (weer) WEIR DIAMETER

Many circular clarifiers have a circular weir within the outside edge of the clarifier. All the water leaving the clarifier flows over this weir. The diameter of the weir is the length of a line from one edge of a weir to the opposite edge and passing through the center of the circle formed by the weir.



WEIR, PROPORTIONAL (weer) WEIR, PROPORTIONAL

A specially shaped weir in which the flow through the weir is directly proportional to the head.

WET OXIDATION WET OXIDATION

A method of treating or conditioning sludge before the water is removed. Compressed air is blown into the liquid sludge. The air and sludge mixture is fed into a pressure vessel where the organic material is stabilized. The stabilized organic material and inert (inorganic) solids are then separated from the pressure vessel effluent by dewatering in lagoons or by mechanical means.

WET WELL WET WELL

A compartment or room 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.

Y, GROWTH RATE Y, GROWTH RATE

An experimentally determined constant to estimate the unit growth rate of bacteria while degrading organic wastes.

ZOOGLEAL FILM (ZOE-glee-al) ZOOGLEAL FILM

A complex population of organisms that form a "slime growth" on the trickling-filter media and break down the organic matter in wastewater. These slimes consist of living organisms feeding on the wastes in wastewater, dead organisms, silt, and other debris. "Slime growth" is a more common word.

ZOOGLEAL MASS (ZOE-glee-al) ZOOGLEAL MASS

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