1007 West College Avenue
Suite 461
Santa Rosa, CA 95401
(707) 793-4800
www.ushydrotech.com ♦ info@ushydrotech.com

ENVIRONMENTAL TERMS BOOKLET FOR WASTE WATER TREATMENT

A

ABSORPTION: Assimilation of molecules or other substances into the physical structure of a liquid or solid without chemical reaction.

ACID: A solution with a pH value less than 7.

ACTIVATED CARBON: Carbon that has undergone a process of activation which greatly increases its surface area and therefore sites for absorption. It is not unusual to have other 3,000 square feet of surface per gram of carbon. Its uses in water treatment are many, including the absorption of taste, odor, and color. A laboratory use is for the concentration of organic matter for waste treatment analysis.

ACTIVATED SILICA: Sodium silicate that has been systematically precipitated by reducing the pH value to below 9, usually by chlorine.

ACTIVATED SLUDGE: A process of secondary waste treatment designed to encourage growth of aerobic bacteria by forcing large quantities of air through the waste and recycling viable bacteria into the incoming waste.

ADSORPTION: Physical adhesion of molecules or colloids to the surface of solids without chemical reaction.

AERATE, AERATION: To impregnate or saturate water or waste with air. Ferrous iron removal, flotation, encouraging aerobic bacteria in waste treatment and carbon dioxide removal are its major purposes.

AEROBIC ORGANISM: An organism, usually in reference to bacteria, that thrives in the presence of oxygen.

AGGLOMERATE: To gather fine particulates together into a large mass.

ALGAE: Simple plants, often microscopic, usually aquatic.

ALGICIDE: A chemical highly toxic to algae, such as copper sulfate, preferably having selective toxicity in the proper concentration for algae with negligible toxicity for other forms of life.

ALKALINITY: Generally considered the bicarbonate, carbonate, and hydroxide contents, although other materials contribute.

AMPHOTERIC: Capable of reacting in water either as a weak acid or as a weak base. For example, aluminum salts hydrolyze in water to produce a compound that may be considered a weak base, or a weak acid. A property of certain oxides makes them reactive both with acid or bases.

ANAEROBIC ORGANISM: An organism, usually in reference to bacteria, that thrives in the absence of oxygen.

ANION: A negatively charged ion resulting from dissociation of salts, acids, or alkalies in aqueous solution.

ANIONIC: The condition of a polymer, colloid, or large particle having exchangeable cations on its surface and an opposite, negative charge on the substrate.

ANODE: In electrolysis or electrochemical corrosion, a site where metal goes into solution as a cation leaving behind an equivalent of electrons to be transferred to an opposite electrode, called cathode.

ANODIZING: The treatment of a metal surface whereby the metal is made anodic.

API GRAVITY: An index of specific gravity defined by the American Petroleum Institute.

API SEPARATOR: A simple gravity separator meeting the design standards of the American Petroleum Institute for separation of oil and solids from wastewater.

AQUIFER: A subsurface, water-bearing, geological rock formation.

ASBESTOS: Insulation is manufactured from mineral asbestos. Frequently used in ceiling and high temperature insulation.

AUTOTROPHIC ORGANISM: An organism capable of consuming inorganic matter and converting it to organic matter.

B

BASE: A solution with a pH value higher than 7.

BAT: Best Available Technology economically achievable.

BAUXITE: The raw material for aluminum sulfate manufacture often imported.

BCT: Best Control Technology, regardless of cost.

BIOCIDE: A chemical that is capable of destroying minerals.

BIOTA: All living organisms of a specified region.

BLOOM, ALGAE BLOOM: A readably visible concentration of algae growth (usually occurring in the absence of an algaecide) when weather, sunlight, and nutrient conditions favor a logarithmic phase of growth.

BOD: Biological Oxygen Demand. The amount of oxygen required by bacteria to destroy organic material present in the wastewater.

BOD LOAD FOR THE TRICKLING FILTER: Pounds of BOD per day, in waste applied, per 1,000 cubic feet of filter volume.

BOD PERCENT REDUCTION: The percent BOD is reduced through treatment. It is a useful figure in the calculation of waste plant efficiency, if not misused.

BPT: Best Practical Technology currently available.

BREAK-POINT CHLORINATION: An extremely effective technique in controlling bacteria, taste and odor. The chlorine dose is increased with an accompanying increase in combined residual to a point where the residual abruptly drops. This is called the break point where combined chlorine is broken apart by further oxidation releasing free nitrogen and other gases. As the chlorine dose is increased, the residual will increase proportionately as free chlorine. This is a simplified explanation.

BROWNIAN MOVEMENT: The bombardment of colloidal particles by molecules of the dispersing medium, which keeps the colloid agitated and suspended indefinitely.

BS & W: (BOTTOM SEDIMENT & WATER): A measure of oil quality based on the volume percent of sediment and water that can be centrifuged from a sample.

BUFFER: A substance in solution, which accepts hydrogen ions or hydroxyl ions added to the solution as acids or alkalis, minimizing a change in pH.

C

CALCITE: A very pure form of calcium carbonate.

CAKE: A term applied to the dewatered residue from a filter, centrifuge, or other dewatering device.

CARBONATE HARDNESS: That harness in water caused by bicarbonates and carbonates of calcium and magnesium. If alkalinity exceeds total hardness, all hardness is carbonate hardness; if hardness exceeds alkalinity, the carbonate equals alkalinity.

CARBON DIOXIDE: A compound that has a great effect on water treatment. It is often a major factor affecting alkalinity, buffer capacity, stability, corrosion, floc setting, filter gassing and a host of minor effects.

CARRYOVER - PIN POINT CARRYOVER: That part of the floc that has not flocculated to a settleable size or has been mechanically sheared or torn up so that it carries over and settles on the filters. It is a measure of coagulation and mechanical flocculation efficiency.

CATALYSTS: Addition of a mineral (catalysts) that does not take a direct part in a chemical reaction but increases the rate of the reaction.

CATION: A positively charged ion resulting from dissociation of molecules in solution.

CATIONIC: The condition of a polymer, colloid, or large particle having exchangeable anions on its surface and an opposite, positive charge on the substrate.

CAUSTIC SODA: A common water treatment chemical, sodium hydroxide (lye).

CHELATING AGENT: Organic compounds having the ability to withdraw ions from their water solutions into soluble complexes.

CHLORAMINE: Combined chlorine formed by the reaction of ammonia. These are reported to be effective bactericides although they have a slower rate of kill. They are used where difficulty is experienced in maintaining a free-chlorine residual and occasionally where phenolic taste makes chlorine undesirable due to the resulting chlorophenol taste. Chloramines are also formed by reaction with nitrogenous portions of the chlorine demand.

CHLORINE: An element widely used in water and waste treatment for disinfection and sterilization. Due to its hazardous nature and by-products it is being replaced. It is a greenish gas under normal conditions, highly toxic on inhalation.

CHLORINE DIOXIDE: A powerful oxidizing agent. It is unstable and is produced in water and waste plants by adding sodium chlorine (not chloride) to raw water containing an excess of chlorine. Caution: reacts violently with most organic material.

CHLORINE FREE: Chlorine in solution uncombined or un-reacted with other materials. This can obviously be obtained only after the entire chlorine demand has been satisfied. This is the most effective bactericidal state. It is common practice to refer to chlorine, hypochlorous acid and hypochlorite as free-chlorine residual.

CLEAN WATER ORGANISMS: The association or ecological balance of many species that are found in an unpolluted environment. Attempts are made to use these as a measure of pollution. The same is true of polluted water organisms.

COAGULANT, COAGULATION: A coagulant is a substance which when added to a colloidal dispersion destabilizes the dispersion by neutralizing the charge on the particles, usually negative, causing the colloidal particles

to collide and agglomerate into larger particles. Coagulation is the term used for this process.

COAGULANT AID: Any material that substantially aids coagulation and/or flocculation but which wouldn't function as a coagulant alone. Such materials are usually highly selective and the dose critical depending upon raw water conditions. They are widely diverse compounds, a few of which are clays, agar, gelatin, sodium silicate (activated silica) synthetic polymers and natural or modified starch.

COD: Chemical Oxygen Demand. A test that measures the amount of the total organic matter in a waste that can be oxidized by a strong oxidizing agent, current potassium dichromate, with silver sulfate as a catalyst under acid conditions. There is seldom a direct correlation with BOD.

COLIFORM: A bacteria group used as an indicator of fecal contamination. Except for special cases they are considered benign. A positive test indicates the possibility of the presence of enteric pathogens, disease germs originating in the intestine.

COLLOID, COLLOIDAL: Small solid particles dispersed in a water medium, is the class of colloidal dispersion normally dealt with in water and waste treatment. The particle size is from 1 to 100 milli-microns, although the actual size may be open to argument, especially at the smaller end of the scale. The particles are charged and exhibit Brownian Movement and the Tyndall Effect.

CONCENTRATION: The process of increasing the dissolved solids per unit volume of solution, usually by evaporation of the liquid; also the amount of material dissolved in a unit volume of solution.

CONDUCTIVITY: The ability of a substance to conduct heat or electricity. Electrical conductivity is usually expressed in microsiemans per centimeter.

CONSISTENCY: In the pulp/paper industry, a term for the density in percent by weight dry matter, of a slurry of pulp.

CONTAMINANT: Any foreign component present in another substance.

COPPERAS: An industrial by-product varying between manufacturers in chemical content, impurities and physical properties. The iron content is bivalent. Its use in the place of ferric sulfate can be harmful, since if not fully oxidized to the ferric state it will carry through to the finished water. Both ferrous and ferric sulfates can be called iron sulfate in generic terminology.

COPPERAS CHLORINATED: Ferrous sulfate oxidized with chlorine in order to function as a coagulant. Theoretically, one pound of chlorine is required to oxidize eight pounds of copperas. In practice, an excess of chlorine is needed. If the copperas is not totally oxidized, soluble ferrous iron will carry through to the finished water.

COPPER SULFATE: Cupric sulfate, bluestone. Its major use in water treatment is as an algaecide.

CORROSION: A term usually used in reference to metals. It is the result of a chemical or galvanic reaction in which the metal is soluble or changed to a soluble metal salt thereby losing weight and being weakened. Where iron is corroded in finished water, the soluble iron results in water quality problems.

CRACKING: An oil-refining process that breaks large molecules into smaller ones.

D

DE-INKING: The process of removing ink from secondary fibers.

DEIONIZATION: Any process removing ions from water, but most commonly an ion exchange process where cations and anions are removed independently of each other.

DEMINERALIZATION: Any process used to remove minerals from water; however, commonly the term is restricted to ion exchange processes.

DESALINATION: The removal of inorganic dissolved solids from water.

DESALTING: The removal of salt from crude oil.

DE-TACKIFY: Treatment of solids from a paint spray booth to eliminate their sticky properties.

DETENTION TIME: The time wastewater is retained in a treatment plant or a specific portion of the plant.

DETERGENTS: Sultanates. Neutralized products of aliphatic and aromatic hydrocarbons. Newer detergents are biodegradable.

DEWATER: To separate water from sludge to produce a cake that can be handled as a solid.

DIALYSIS: A separation process that depends on differences in diffusion rates of solutes across a permeable membrane.

DIATOMS: Organisms related to algae, having a brown pigmentation and a siliceous skeleton.

DIGESTION, DIGESTER: A term generally used to describe a process of anaerobic decomposition of solids to methane and carbon dioxide. Total detention time is reported to be from 10 to 30 days to two to three months. Sometimes aerobic digestion is used.

DILUTION FACTOR: The effect of a large volume of liquid dilution.
Waste treatment - the effect of a given volume and strength of waste when dispersed in a receiving body of water. As an example, total treatment may be necessary during low flow stream conditions, but little or none necessary during flood stage.
Water treatment - usually used in reference to chemical feed. A chemical may be corrosive in a concentrated solution but have no corrosive effect at all when diluted by the raw water.

DISINFECTION: To free from infectious, disease producing or harmful microorganisms.

DISPERSANT: A chemical, which causes particulates in a water system to remain in suspension.

DISSOLVED OXYGEN: Quantity in of ppm oxygen dissolved in systems above requirements for BOD and COD. Measure of water quality.

DISSOLVED SOLIDS: D.S. Technically any material that has been dissolved, becoming a true solution. Finely-divided and colloidal solids sometimes are reported as D.S. or Total Dissolved Solids T.D.S. These are more correctly included as suspended solids.

DMR: Discharge Monitoring Reports.

DOMESTIC WATER WASTE: Sewage from homes without industrial contaminants.

DOT: Department Of Transportation.

E

ECOLOGY: The science of the interrelationships between living organisms and their total environment.

ELUTION: The process of extracting one solid from another. Often used incorrectly to describe the regeneration of an ion exchanger.

ELUTRIATION: The washing of sludge to remove soluble materials which may inhibit coagulation and compacting, which reduces the final volume of sludge.

EMULSION: A colloidal dispersion of one liquid into another.

ENTRAINMENT: The transport of water into a gas stream. In a boiler, this referred to as carryover, in a cooling tower, drift.

ENVIRONMENT: The sum of all external influences and conditions affecting the life and development of an organism. Total environment is a redundant term used to emphasize the effect of slight and often momentary changes usually induced by man.

EPA: Environmental Protection Agency. Formed in 1970. Administers 9 Federal Environmental Laws:
CAA - Clean Air Act
CWA - Clean Water Act
SDWA - Safe Drinking Water Act
CERCLA - Comprehensive Environmental Response Compensation and Liability Act (SUPERFUND)
RCRA - Resource Conservation & Recovery Act
FIFRA - Federal Insecticide, Fungicide & Rodentcide Act
MPSRA - Marine Protection Research & Sanctuaries Act
UMTRCA - Uranium Mill Tailings Radiation Control Act
TSCA - Toxic Substance Recovery Act

EUTROPHICATION: Nutrient enrichment of water. Eutrophic waters support rich organic production such as algae blooms. The term is sometimes used to describe the mechanism causing the filling of a lake with solid wastes.

F

FACULATIVE BACTERIA: Bacteria able to grow under either aerobic or anaerobic conditions. Faculative aerobes are fundamentally aerobic but can grow or even thrive in the absence of oxygen. A faculative anaerobe is anaerobic but can grow in the presence of oxygen.

FAT: Basically insoluble animal fat.

FAUNA: The entire animal life of a specific region.

FDA: Food & Drug Administration

FERRIC CHLORIDE: A trivalent iron coagulant and sludge conditioner. Its water treatment use is limited by its corrosiveness even to stainless steel and toxicity to handling personnel when putting it into a solution.

FERRIC HYDROXIDE: The product and floc former resulting from the use of ferric iron coagulants. In natural water the floc is composed of complex chemicals including ferric hydroxide, but the chemical characteristics are analogous. Ferrous hydroxide is insoluble at all normal pH's encountered in water and waste treatment since its non-amphoteric.

FERRIC SULPHATE: A widely used coagulant and sludge conditioner, which tolerates a wide range of pH and turbidity conditions. The contained iron is in the trivalent state, and therefore a coagulant without further oxidation.

FILTER AID: Similar to coagulant aids but added to water prior to filtration. Their purpose appears to be to produce an artificial or synthetic " schmutzdecke " to improve the efficiency of filtration. They have proven

useful with filters in poor condition in which particulate migration or breakthrough occur. They are also recommended for some high rate filters.

FILTERS, ANTHRACITE, ANTHRAFILT: Graded similarly to a sand filter, but considerably coarser and lighter. It requires less backwash pressure, but the coarseness (0.72 mm) sometimes allows particulate and bacterial migration, or breakthrough, and requires frequent backwashing.

FILTER, CAPPED: A portion of the top level of a sand filter is replaced with anthracite media. This gives longer filter runs with the safety of the sand filters. Results have generally been good.

FILTER, HIGH RATE: An apparently successful attempt to increase the rate of sand filtration and utilization of the entire bed rather than the top four to eight inches. The media is graded by the density so the large media is on the surface with the particle size decreasing with depth. It is relatively new , but excellent results have been observed.

FILTER, LABORATORY: The choice of filters and methods will depend on the size of the particulate matter to be removed or the size of the particles that can be tolerated in the filtrate. Ordinarily, laboratory filter papers vary widely in porosity. Usually the higher the number designating the paper, the smaller the particle it will remove.

FILTER PRESSURES: Mainly used in industrial water treatment, but occasionally found in municipal treatment plants. It is a filter entirely enclosed in a metal tank except for inlet and outlet connections. The media varies widely.

FILTER, RAPID SAND: The filter media is sand graded by size with the smallest size being on the surface. The normal filter rate is approximately 2 gal. /min./sq. ft. before loss of head and backwash. It is reported that only the top four to eight inches is utilized.

FILTRATE: The liquid remaining after removal of solids with a filter.

FILTRATION: The process of separating solids from liquids by means of a porous substance through which only the liquid passes.

FLASH: The portion of a superheated fluid converted to vapor when it's reduced.

FLASH MIX, FAST MIX: This stage, along with accurate chemical feed, is the heart of every water plant and waste plant utilizing coagulation. The coagulant must be completely mixed with the raw water or waste within seconds to obtain optimum results from coagulation.

FLOC: Turbidity or particulate matter that has been agglomerated. Whether particulate agglomeration has proceeded enough to be called a FLOC is a matter of individual judgment.

FLOCCULATION: The process of agglomeration or building of the macrofloc, resulting from coagulation, into large agglomerates, until the sheer force of water movement presents further building or until it settles out. There is an academic argument over the mechanisms, however it is generally held that the greatest effects on flocculation are caused by the quality of the earlier chemical coagulation stage, and from that point the mechanical efficiency designed into the plant; therefore flocculation is a mechanical process.

FLOCCULATOR: That portion of a water or waste plant following the flash mix but prior to settling. The purpose of the flocculator is to gently agitate

the macrofloc from the flash mix giving it the opportunity to build larger without shearing or tearing up the FLOC in any way. This non-shearing requirement is ignored in some plant designs resulting in poor efficiency, high chemical costs, short filter runs, and marginal quality finished effluent.

FLORA: The entire plant life of a specific region.

FLOTATION: A process of separating solids from water by developing a froth in a vessel in such fashion that the solids attach to the air particles and float to the surface for collection.

FLOURIDATION: The addition of small quantities of a fluoride to potable water to bring the maximum fluoride content to the usually recommended level of 1.0 to 11 mg/l. Fluoridation is thought to decrease dental cavities in children.

FOG: Fates, **O**ils, and **G**rease. Includes: hydrocarbons, fatty acids, soaps, fats and waxes whose content is determined by freon extraction of the sample and infrared analysis of the extract. The method includes both suspended and dissolved substances. Usually the dissolved substances cannot be removed by mechanical means.

FUEL OIL: Generic term for hydrocarbon fuels.

FUNGI: As applied to water, simple, one-celled organisms without chlorophyll, often with filaments. Molds and yeast's are included in this category.

FWPCA: Federal Water Pollution Control Act.

G

GALVANIC COUPLE: The connection of two dissimilar metals in an electrolyte that results in current flow through the circuit.

GANG MIXER: Multiple unit stirrers.
GPM: Gallons per minute of a flowing stream.

GRAINS PER GALLON: A unit of concentration. Lgr/gal = 17.1 mg/l.

GREASE: Compounded solid lubricant - contains petroleum base oil, animal fats, soaps (usually sodium, calcium, lithium), and special chemicals.

GRIT, GRIT CHAMBER: In waste treatment, a chamber ahead of primary settling to remove sand, gravel, and larger inorganic matter. They are desirable on all waste treatment plants and almost a necessity where there are cross connections between storm and sanitary sewers.

GROUND WATER: The water beneath ground surface.

H

HARDNESS: The concentration of calcium and magnesium salts in water. Hardness is a term originally referring to the soap-consuming power of water; as such, it is sometimes also taken to include iron and manganese. A looser definition is any cation or anion that is capable of reacting with soap to from precipitates curds or scale.

HARD WATER: The measurement of the amount of divalent metallic ions contained by water.
Soft - 0 to 75 mg/l.
Moderate - 75 to 150 mg/l.
Hard - 150 to 300 mg/l.
Very hard - over 300 mg/l.

HAZARDOUS WASTE: Waste which is listed by the EPA as being a danger to human health or the environment. Also includes waste which may not be listed but has one or more of the following characteristics: it is ignitable, it is corrosive, or it reacts violently with water or other materials.

HAZARDOUS WASTE LABEL: Label, applied to waste containment, showing content and date collected.

HERBICIDE: Chemicals intended to kill plant life, can be selective or general.

HUMIDIFICATION: The addition of water vapor to the air.

HYDRAULIC LOAD: The gallons of flow per day per square foot of filter surface area. The use of metric measurement is also accepted.

HYDROPHILIC: Having an affinity for water. Its opposite, non-watter-wettable, is hydrophobic.

IGNITABLE WASTE: Combustible or flammable materials; paints, solvents, oils, etc.

INCOMPATIBLE WASTE: Waste that reacts with other materials or water.

INDICATOR ORGANISMS: An organism found only under certain conditions (usually used regarding pollution), or in the absence of certain conditions. Equating pollution to specific organisms is useful, although a better correlation is made by observation of the ecological balance.

INDUSTRIAL WASTE WATER: Water containing any type of industrial contaminants as well as sanitary sewage.

I**NFILTRATION**: In leakage of groundwater into sewage piping.

ION: An atom or molecule that has lost or gained one or more electrons, becoming electrically charged.

ION EXCHANGE: A process by which certain undesired ions of given charge are absorbed from solution within an ion-permeable absorbent, being replaced in the solution by desirable ions of similar charge from the absorbent.

IONIC STRENGTH: A measure of the strength of a solution based on both the concentrations and valences of the ions present.

IONIZATION: The dissociation of a molecule into atoms or groups of atoms. This occurs when salts are dissolved in water. As an example, when copper sulfate is dissolved in water, the solution contains positive copper ions and negative sulfate ions.

IRRIGATION: Land application for disposal of effluents.

L

LIME: A common water treatment chemical. Limestone is burned to produce quicklime, which is mixed with water to reduce slaked or hydrated lime.

LIMESTONE: A rock containing mainly calcium carbonate and impurities.

LIMESTONE, DOLOMITIC: Limestone containing both calcium carbonate and magnesium carbonate.

LOTIC ENVIRONMENT: Running water such as rivers.

LUBE OIL: Special crude fraction for viscosity - contains up to 50% chemical blending materials.

M

MACROFLOC: The stage of flocculation when the floc grows large enough to be seen.

MACROORGANISM: An organism visible to the unaided eye.

MACROSCOPIC: Large enough to be seen by the unaided eye.

MCL: Maximum Contaminant Level of pollution in drinking water.

MEMBRANE: A barrier, usually thin, that permits the passage only of particles up to certain size or special nature.

METALS: Limitations have been placed on the quantities of metals that can be discharged from treating plants. Specifications are not always consistent nor are they the same for every operation. A processor must analyze his process for compliance. List of metals with restrictions:
ALUMINUM
CADIUM
MAGANESE
ARSENIC
CHLORINE
NICKEL
AMMONIA
COPPER
NITRATES
ANTIMONY
CYANIDE
PHOSPHORUS
BARIUM
CHLORIDES
SELENIUM
BERYLLIUM
FLOURIDES
SILVER
BROMIDE
IRON
SULFIDES
BROMATES
LEAD
ZINC
BORON
MERCURY

MF: Membrane Filter - a bacterial count method.

MG / LITER: Milligrams of a substance contained or dissolved in 1000 liters of solution (usually water). Equivalent to parts per million.

MICROORGANISM: Any organism small enough to be invisible or indistinguishable to the unaided eye. Some authorities hold that they are only those organisms that can be seen with a microscope.

MINERAL: Any inorganic or fossilized organic material having a definite chemical composition and structure found in a natural state.

MIXING ZONE: Waste water effluent to streams, lakes, canals, etc. They must be properly mixed with existing water and meet specifications set for location.

MPN: Most probable Number - a bacterial count method.

N

NATIONAL RESPONSE CENTER: Place to call in case of spill (800) 424- 8802. Failure to do so may result in jail sentence and fine.

NCP: National Contingency Plan - guide for Superfund activity.

NEMATODES: Any of a class or phylum nematode, unsegmented roundworms or threadworms. They live as parasites or live free in soil and water. Many have a high tolerance for chlorine, thereby protecting some ingested bacteria and virus.

NESHAPS: National Emissions Standards for Hazardous Pollutants - very hazardous materials, small quantities.

NEUTRALIZATION: Most commonly, a chemical reaction that produces a resulting environment that is neither acidic nor alkaline. In addition, the addition of a scavenger chemical to an aqueous system in excess concentration to eliminate a corrosive factor, such as dissolved oxygen.

NON-CARBONATE HARDNESS: Hardness in water caused by chlorides, sulfates and nitrates of calcium and magnesium.

NOTIFICATION OF HAZARDOUS WASTE ACTIVITY FROM: EPA-8700-12 (85) - application for EPA number. Covers hazardous waste accumulated.

NPDES PERMIT: The National Pollution Discharge Elimination System permit required by and issued by EPA.

NUTIRENTS: Nutrient discharges are limited for many waste stream discharges. This is especially true for nitrogen, phosphorus and potash that may enter streams or lakes. List of nutrients: total nitrogen, total phosphorus and total potassium.

O

OCCLUSION: An absorption process by which one solid material adheres strongly to another, sometimes occurring by co-precipitation.

OIL: Generic term, includes hydrocarbons, vegetable oils, shale oil, etc.

OLIGOTROPHIC WATER: Water with a small or negligible supply of nutrients that therefore will support little organic production.

OPACITY: The percentage of light transmission through a plume.

ORP: Oxidation Reduction Potential.

ORTHOTOLIDINE: A colorimetric indicator for chlorine residual. It is oxidized well in acid solution by chlorine and chloramines forming a yellow color. It has been proposed as a method of determining divalent manganese, which interferes with orthotolidine chlorine tests, giving high readings.

OSMOSIS: The passage of water through a permeable membrane separating two solutions of different concentrations : the water passes into the more concentrated solution.

OTHER CHEMICALS: Includes miscellaneous chemicals that may become involved in waste streams. List of other chemicals:
DETERGENTS
POLYCHLORINATED BIPHENYL
DISSOLVED GASES
RADIOACTIVE MATERIALS
DISSOLVED OXYGEN
SOAPS
FAT, OIL, GREASE
USED OIL

OXIDATION: A chemical reaction in which an element or ion is increased in positive valence, losing electrons to an oxidizing agent.

P

PACKING: The fill in a confined space of a stripping vessel, ranging from simply shaped units such as rocks or slats to complex shapes that provide large surface area per unit volume.

PATHOGENS: Disease causing microbes.

PCB: Polychlorinated Biphenyl - used in transformer oils and some capacitors. Carcinogenic.

PERCENT DRY SOLIDS: A waste treatment term specifying the percent dry solids in the filter cake or sludge.

PERIODIC CHART: An arrangement of the elements In order of increasing atomic number that illustrates the repetition (or periodicity) of key characteristics.

PERMEABILITY: The ability of a body to pass a fluid under pressure.

PESTICIDES / HERBICIDES: The limitations on pesticides and herbicides reflect the requirements for potable water as well as the carcinogenic nature of many of these materials. List of pesticides and herbicides:
PARATHION
DEMETON
LINDANE
POLYHEDRON

ALDRIN
ENDOSULFAN
MALATHION
TOXAPHENE
CHLORDANE
ENDRIN
METHOXYCHLOR 2-2-4-D
CUSHION HEPTACHLOR
MIREX 2-4-5-TP
DDT

pH: The measure of acidity or alkalinity of a solution. It is the negative logarithm of the hydrogen ion concentration and as such represents the values on an exponential scale. A pH of 7 is neutral, while a pH of 1 is strongly acidic and a PH of 14 is strongly basic.

PHOTOSYNTHESIS: The process of converting carbon dioxide and water to carbohydrates activated by sunlight in the presence of chlorophyll, liberating oxygen.

PIN POINT FLOC: Any floc that has not developed much beyond the macrofloc, or in the case of a poorly designed water plant, the remnant of a properly formed floc which has been mechanically sheared or broken up to the original size of the macrofloc.

PLANKTON: Unattached organisms of small, mostly microscopic size, that have little or no power of locomotion.

PLANKTON PHYTO: Plant plankton.

PLANKTON ZOO: Protozoa and other animal plankton.

POD: Point of Discharge

POTASSIUM PERMANGANATE: A powerful oxidizing agent, which is gaining wide acceptance in water treatment for removal of taste and odor, soluble manganese ferrous iron and color. It is a dark purple crystalline substance, non-corrosive to iron and most plastic but readily attacks rubber. CAUTION: Reacts violently with most organic materials.

PPB: Parts per Billion. Parts of material per billion parts of a solution on a weight basis.

PPM: Parts per Million. Parts of material per million parts of solution on a weight basis.

PRECIPITATE: An insoluble reaction product; in an aqueous chemical reaction, usually a crystalline compound that grows in size to become settle able.

R

RAG: Debris that accumulates at the oil - water interface.

RBW: Receiving Body of Water. The lake, stream, canal, bay, etc. into which an effluent stream discharges.

REACTIVE WASTE: Undergoes violent and rapid chemical reaction.

RECARBONATION: Water that has been lime or soda ash softened is supersaturated with calcium carbonate. To prevent the eventual precipitation on filter sand, water mains, etc., carbon dioxide is reacted with the calcium carbonate forming the removal; the carbon dioxide reduces the caustic alkalinity and soluble calcium. Carbon dioxide is generated by special coke ovens or natural gas burners.

REDOX POTENTIAL: Reduction - oxidation potential measured against a standard electrode.

RED WATER: A descriptive but nonspecific term for finely divided particulate matter contaminating finished water and imparting a brown or reddish cast.

REDUCTION: A chemical reaction in which an element or compound gains electrons, being reduced in positive valence.

REVERSE OSMOSIS: A process that reverses (by the

application of pressure) the flow of water in the natural process of osmosis so that it passes from the more concentrated to the more dilute solution.

S

SANITARY SEWER: Largely domestic wastewater plus some industrial waste.

SARA: Supervened Amendments and Reauthorization Act.

SATURATION INDEX: The relation of calcium carbonate to the pH, alkalinity and hardness of a water to determine its scale-forming tendency.

SCALE: The precipitate that forms on the surfaces in contact with water as the result of a chemical or physical change.

SECONDARY CONTAINER: Double wall tanks, buffer zone - EPA regulations.

SECONDARY TREATMENT: This type of treatment refers to wastewater treatment for control of BOD, COD, suspended solids, turbidity, and bacteria and virus control.

SELECTIVITY: The order of preference of an ion exchange material for each of the ions in the surrounding aqueous environment.

SEQUESTER: To form a stable, water-soluble complex.

SHANNON WEAVER INDEX: Measure of shellfish protection.

SHORT CIRCUIT: Water current characteristics in a settling basin, lagoon, classifier and to a lesser degree in flocculators that channel a portion of the water or waste directly to the effluent or outlet without taking advantage of the detention time designed to give complete treatment. It results in a poorly treated or sub quality effluent. Some short-circuiting is often seen in new plants and can be easily alleviated by a number of methods.

SILT DENSITY INDEX: A measure of the tendency of a water to foul a reverse osmosis membrane, based on timed flow through a membrane filter at constant pressure.

SIPS: State Implementation Plans - state control of air pollution.

SLIGHTLY HYGROSCOPIC: (MILDLY HYGROSCOPIC) terms often used to remind the reader that a product will take on moisture under some conditions although not nearly as deliquescent as a product such as calcium chloride or ferric chloride. Testing under handling conditions is recommended since variables affect the rate moisture can be absorbed . Relative humidity, equipment surface temperature and volume of air in the case of pneumatic systems are but a few.

SLOP OIL: A general term in oil refining applying to tramp oil discharge to the oily sewer during shutdown and start-up or through abnormal operation.

SLUDGE CONCENTRATION: The percent of total solids in sludge.

SLUDGE VOLUME INDEX: An inverse measure of sludge density.

SLUDGE, VOLUME OF: A waste treatment term specifying the cubic feet of sludge per million gallons of water flow.

SLUDGE, WEIGHT OF DRY SOLIDS: A waste treatment term specifying the pounds of dry sludge solids per million gallons of water flow.

SLURRY: Water containing a high concentration of suspended solids, usually over 5000mg/l.

SOAPS: Neutralization products of organic fatty acids, usually sodium based.

SODA ASH: A common water-treatment chemical, sodium carbonates.

SOLIDS, SETTLEABLE: Those solids that will settle without coagulation under quiescent conditions. In waste treatment analysis an Imhoff cone is generally used and settle able solids reported as mg/l. This data will not correlate if coagulation is used due to the larger quantities of denser solids settled.

SOLIDS, SUSPENDED: True solids, which will not settle under quiescent conditions within a reasonable length of time. Colloidal particles fall within this definition, but if solids determination is made by filtration, colloids will pass the filter and not be counted. Since colloidal solids are one-fourth or more of the total solids of domestic sewage, precise comment on the method of reporting results is important. Suspended Solids content - in water treatment turbidity it is often a more convenient method of reporting than suspended solids.

SOLIDS, TOTAL, T.S.: A measure of all solids in a waste determined by evaporating it to dryness.

SOLIDS, VOLATILE: A measure of the amount of organic matter present in a waste determined by combustion under carefully controlled temperature conditions to convert organics to carbon dioxide and water but not to volatilize inorganics which would result in major error.

SOLIDS, WATER TREATMENT: True dissolved solids, which greatly affect stability calculations, although often ignored.

SOLID WASTE: Waste solids, no longer usable' to be disposed of or recycled.

SPCC: Spill Prevention and Countermeasure.

STERILIZATION: To be free from living organisms. Sometimes less correctly defined as the absence of lower organisms.

STOKES' LAW: An expression for calculating the rate of fall of particles through a fluid based on densities, viscosity and particle size.

STORM SEWER: Collection system for surface run-off.

SURFACE WATER: Lakes, Streams, Canals, Waterways, etc.

SURFACTANT: A surface-active agent; usually an organic compound whose molecules contain a hydrophilic group at one end and an oilophilic group at the other.

T

TDS: Total Dissolved Solids. Represents the total material actually dissolved in water and should not be confused with suspended solids or turbidity. Total dissolved solids can include both organic and inorganic materials.

TOC: Total Organic Compounds.

TOXIC POLLUTANTS: States must set specifications and cover in permits under NPDES by February 28, 1989 - extensive fines.

TP: Total Phosphorus.

TSS: Total Suspended Solids. Represents the material held in suspension in the stream and subject to removal by settling or flocculation. They generally consist of insoluble organic material as well as sand, grit, and sometimes heavy metals.

TURBIDITY: A suspension of fine particles that obscures light ray but requires many days for sedimentation because of the small particle size.

TURNOVER: Sometimes called thermal turnover, fall or spring overturn. It applies particularly to impoundment's and lakes. A naturally occurring physical mixing of the stratified zones often accompanied by great increase in manganese, iron, taste and odor. It is usually caused by thermal changes resulting in disruptive density changes of water in one or more zones. It is sometimes caused or augmented by wind.

TYNDALL EFFECT: The effect of light scattering or reflection by colloidal particles, which does not occur with true solution. If a particle is so small as not to exhibit this reflection of a strong beam of light, it is usually considered molecular in size and not colloidal. Some particles of organic color may open this definition to argument.

U

UNIFORM HAZARD WASTE MANIFEST: EPA form required for hazardous waste shipments.

V

VENTURI: A device for measuring fluid flow, including a short converging cone succeeded on the same axis by a long diverging cone. This device is also used in gas scrubbing.

W

WATERFLOODING: A process of displacing oil from underground formations with water and returning it to the surface for recovery.

Z

ZETA POTENTIAL: The difference in voltage between the surface of the diffuse layer surrounding a colloidal particle and the bulk liquid beyond.

pH Range for Optimum Precipitation of Contaminants

Symbol	Contaminants	pH range to precipitate
Ag	Silver	9 to 14
Al	Aluminum	7 to 8
As	Arsenic	not precipitated
Bi	Bismuth	7 to 14
Cd	Cadmium	7 to 14
Co	Cobalt	8 to 14
Cr	Chromium	7 to 14
Cu	Copper	7 to 14
Fe	Iron	7 to 14
Hg	Mercury	7 to 14
Mn^{+2}	Manganese	8 to 14
Mn^{+4}	Manganese	7 to 14
Mo	Molybdenum	not precipitated
Ni	Nickel	8 to 14
Pb	Lead	7 to 8
Sb	Antimony	7 to 8
Se	Selenium	not precipitated
Sn	Tin	8 to 14
V	Vanadium	7 to 8
Zn	Zinc	8 to 10

pH: The measure of acidity or alkalinity of a solution. It is the negative logarithm of the hydrogen ion concentration and as such represents the values on an exponential scale. A pH of 7 is neutral, while a pH of 1 is strongly acidic and a PH of 14 is strongly basic.