

## WASTE & BIOCONVERSION GLOSSARY

**Anthropogenic** → Relating to the science of man.

**Amino acids** → Compounds, containing within their structure at least one amino group (NH<sub>2</sub>) and one carboxylic group (-COOH). Sub-units of amino acids make up proteins.

**Amplitude** → The magnitude of the maximum displacement of an oscillating sound wave.

**Anaerobic digestion** → Digestion of organic matter by anaerobic microbial action, resulting in the production of methane gas.

**Anaerobiosis** → The presence of life in an anaerobic environment.

**Anion A** → negatively charged ion.

**Anion exchange capacity** → The ability to exchange positively charged particles of two or more compounds, measured in milliequivalents per 100 grams.

**Aquaclude** → Rocks and soils which transmit water with difficulty, e.g. clay, shale and unfractured granite.

**Aquifer** → Rocks and soils which transmit water with ease through their pores and fractures, e.g. limestone, sandstone and fractured granite.

**Aromatic compounds** → Compounds which contain a six-membered ring of carbon atoms, known as a benzene ring, e.g. vitamin B.

**Atmospheric boundary layer** → A region near the earth in which the relative velocity increases from zero with elevation, due to the motion of the atmosphere relative to the earth's surface.

**Atmospheric inversion** → A term which describes the rising of warm air above cold air when two air masses of different temperatures, humidity and pressure meet.

**Attached growth** → Fixed microbial growth on the media surface in a trickling filter.

**Attenuate and disperse landfill sites** → The traditional type of landfill site from which the leachate produced seeps through soil assures and pores into the underlying saturated zone, where it is diluted.

**Attrition** → A gradual abrasion.

**Auto-ignition temperature** → The temperature to which a reactive mixture must be raised so that, under certain conditions of pressure and after a specific period of time, that mixture will spontaneously ignite.

**Autotrophic** → A term applied to organisms which produce their own organic constituents from inorganic compounds utilizing energy from sunlight or oxidation processes.

**Available water content** → The water available in the soil for plant use, i.e. the difference between the permanent wilting point and the field capacity.

**Avogadro number** → The number of atoms of carbon in exactly twelve grams of the carbon-12 isotope, i.e.  $6.023 \times 10^{23}$ .

**Bag filter** → A row of fabric bags through which a gas stream is passed for the removal of particulate matter.

**Baling** → A compaction process in which the volume of waste requiring to be stored or transported is reduced.

**Bandspreading → The spreading of fertilizers in thick bands, 300 mm apart.**

**Baseflow → Water which enters streams from persistent, slowly varying sources and maintains streamflow between water-input events.**

**Basidia → The reproduction cell of the fungal group, *Basidiomycetes*, which contains the mushroom puffballs and rust.**

**Bearing capacity → A measure of the load per unit area that a material can withstand before failure.**

**Benthic → Of the bottom.**

**Bentonite → A natural clay whose particles form a skin of very low permeability on an excavated soil face The skin supports the soil hydrostatic pressure, thereby promoting stability.**

**Benzene ring → The basic structure of benzene: six carbon atoms arranged in a ring, each with a hydrogen atom attached.**

**Binary fission → A form of reproduction of micro-organisms in which the cell mass is passed on as two new individuals to the succeeding generation and the biomass is retained within the population.**

**Biochemical oxygen demand (BOD) → A measure of the amount of oxygen used by bacteria**

**Biocide → A chemical toxic or lethal to living organisms.**

**Biodegradable → Capable of decomposition by living matter.**

**Biodiversity → The infinite range of living organisms found within an ecosystem.**

**Biome** → A major regional ecological community, characterized by distinct life forms and principal plant or animal species.

**Biosolids** → The semi-solid end product of wastewater treatment.

**Biosphere** → The part of the earth and the atmosphere in which life can occur.

**Biotope** → The smallest geographical unit of the biosphere or of a habitat, characterized by its biota, that can be defined by convenient boundaries.

**Bluff body** → A body which is of angular, rather than aerodynamic, shape.

**Bound water** → A thin film of water held by adhesion to the surface of soil particles.

**Buoyancy** → The upward force that acts on a body which is totally immersed in a fluid and is equal to the weight of the fluid displaced by the body.

**Bubbling bed** → Expansion and fluidization of the sand of a fluid-bed incinerator caused by high rate passage of air.

**Budding** → A type of asexual reproduction in which new cells are formed as outgrowths of a parent cell.

**Buffer** → A solution which undergoes only a slight change in pH when  $H^+$  or  $OH^-$  ions are added to it.

**Buffer stripping** → The cultivation of narrow strips of land across the slope of the land rather than parallel to it, with the aim of reducing soil erosion.

**Bulking agent** → A low density material, usually domestic refuse, straw or woodchips which is mixed with compost to permit air circulation while the compost is digesting.

**Buttress zone → Zone of protection.**

**Can velocity → The velocity of the gas in the passages between the filter units in the filter house of a gas filter.**

**Capillarity → The rise of water in tubes of small bore due to the adhesion between the water molecules and the surface of the vessel wall.**

**Capillary suction time (CST) → A laboratory-determinable parameter defining the dewaterability rate of a wastewater sludge.**

**Capillary water → Water held in soil micropores by weak capillary forces.**

**Capsid → A protein coat surrounding the nucleic acid of a simple virus.**

**Capsule → A layer of well-organized materials lying outside and adhering to the bacterial cell wall.**

**Carotenes See carotenoids.**

**Carotenoids → A group of plant pigments of an orange, yellow or red color which assist in photosynthesis, absorb light in the violet – blue range but whose presence is usually masked by chlorophyll. They contain the groups carotenes and xanthophylls.**

**Catalyst → A substance which alters the rate of a chemical reaction but which is not used up and is unchanged chemically at the end of the reaction.**

**Catchment → A natural drainage basin which channels rainfall into a single outflow.**

**Cation → A positively charged ion.**

**Cation exchange capacity → The ability to exchange negatively charged particles of two or**

**more compounds, measured in milliequivalents per 100 grams.**

**Cavity zone → A region within which there is little mixing of air.**

**Cellular storm → A rainfall event consisting of a number of discreet rainfall-bearing cells (clouds).**

**Cell wall → The outer supporting layer of a plant cell made by the protoplast and consisting largely of cellulose.**

**Chemical oxygen demand (COD) → A quick chemical test to measure the oxygen equivalent of the organic matter content of wastewater that is susceptible to oxidation by a strong chemical.**

**Chemisorption → Adsorption involving very strong bonding forces**

**Chemotrophic → A term applied to organisms which produce their own organic constituents from inorganic compounds utilizing the energy obtained from the oxidation of hydrogen sulphide.**

**Chloracne → A widespread acneform eruption due to exposure to compounds such as dibenzofurans, dibenzodioxins and chlorodiphenyls.**

**Chloramine → A compound composed of chlorine and ammonia.**

**Chlorination → A disinfection technique used in water treatment, involving the addition of Cl<sub>2</sub> gas, chlorine dioxide, sodium hypochlorite or calcium hypochlorite.**

**Chlorofluorocarbons (CFCs) → Compounds containing chlorine, fluorine or bromine, used as aerosol propellants, refrigerants, foaming agents and solvents and which, on decomposition by sunlight, produce oxides of chlorine responsible for the removal of ozone from the stratosphere.**

**Chlorophyll** → A photosynthetic plant pigment which absorbs red and blue light but reflects green light. The chlorophyll molecule has a square head, magnesium at the center and a long tail.

**Chlorophyll a** → The most important of the pigments in chlorophyll, found in all photosynthetic plants except bacteria.

**Chlorophyll b** → One of the constituent pigments of chlorophyll, found in higher plants and green algae.

**Chloroplast** → A chlorophyll-containing, cytoplasmic body of plant cells where photosynthesis occurs.

**Chromatophore** → A plastic containing colored pigment.

**Cilia** → Whiplike structures of 5 – 20 µm length which allows bacterial mobility by beating with a swimming action.

**Circulating bed** → Recovery of solids from the gas phase of a fluidized bed combustion reactor, followed by reinjection into the sand bed.

**Closed loop recycling** → The remanufacture of a new product from a retired product of the same type.

**Coagulation** → The water/wastewater treatment process of destabilizing colloidal particles to facilitate particle growth during flocculation by either double-layer compression, charge neutralization, interparticle bridging or precipitate enmeshment.

**Coarse fish** → Fish, e.g. mullet, which are able to tolerate low oxygen levels.

**Coepod species** → A phylum containing the Crustacea, i.e. small freshwater and marine animals, of which some plankton is composed.

**Conductivity** → A measure of the ability of a solution to conduct an electrical current and is proportional to the concentration of ions in the solution.

**Coliforms** → Non-pathogenic bacteria present in the intestines of warm-blooded animals, water and wastewater, whose numbers indicate contamination.

**Colloids** → Very small particles in suspension, e.g. clays.

**Combustion** → A high temperature process involving the decomposition of organics in an excess of air.

**Completely mixed reactor** → An aeration tank in which, on entering, the influent wastewater is dispersed immediately throughout the reactor volume.

**Composting** → The biological stabilization of wastes of biological origin under controlled conditions.

**Compound** → A substance, the molecules of which consist of two or more different kinds of atoms.

**Compression settling** → Particles are present in such a high concentration that they touch each other and settling can occur only by compression of the particle mass.

**Condensation point** → That level above the earth's surface to which a parcel of unsaturated air must ascend before becoming saturated.

**Constructed wetland** → A biological wastewater treatment system which utilizes plants for the degradation of organic waste.

**Contact stabilization** → A wastewater treatment plant in which there are two tanks, one for the



**adsorption of organic matter onto the suspended solids and another for oxidation of the adsorbed materials.**

**Containment landfill sites → The modern landfill site, in which the leachate generated is contained by bottom liners, collected and treated.**

**Contaminated site → A landfill into which hazardous polluting waste has been dumped.**

**Contour ploughing → Ploughing across the slope of the land rather than with it, to prevent soil erosion.**

**Convection → Transport of heat by vertical movement of a heated body.**

**Convective precipitation → When a parcel of air which is less dense than the air surrounding it, rises, it cools and loses moisture which falls to the earth as rain.**

**Coriolis force → A transverse force, caused by the movement of the earth about the sun, which causes a build-up in the level of water to the right of a tidal current in the northern hemisphere and to the left in the southern hemisphere.**

**Corona → The upper portion of a body part.**

**Criteria pollutant → Emissions to the urban air traditionally seen as polluting, e.g. carbon monoxide [CO<sub>2</sub>], sulfur dioxide [SO<sub>4</sub>].**

**Cryogenic → Producing very low temperatures.**

**Cyanide → A highly poisonous salt of hydrocyanic acid, used frequently in the extraction of gold and silver.**

**Cyclone separator → A means of purifying an air stream by using both gravitational and centrifugal forces.**

**Cytotoxic** → Damaging to cell structure and cell division.

**Daphnid species** → The phylum containing the Branchiopodia, i.e. marine solitary, benthic animals with a shell of two valves.

**Denitrification** → The chemical reduction of nitrate and nitrite to gaseous forms: nitric oxide, nitrous oxide and dinitrogen:  $\text{NO}_3^-$  →  $\text{NO}_2^-$  →  $\text{NO}$  →  $\text{N}_2\text{O}$  →  $\text{N}_2$

**Deoxyribose nucleic acid (DNA)** → A large organic molecule found in the cell nucleus, containing a phosphate group, five-carbon sugars (deoxyribose) and four different nitrogenous bases in a repetitive structure.

**Detritivores Organisms** → which feed on fragmented particulate organic matter.

**Dewatering of sludge** → A mechanical unit operation which increases the dry solids concentration of the sludge from 3.9 percent after digestion to 25 – 30 percent thereby ensuring that the sludge effectively behaves as a solid for handling purposes.

**Diffusion** → The process by which gases and liquids spread themselves throughout any space into which they are put.

**Dilute-phase bed** → The stage in fluidized bed combustion at which the bubbling of the reactor bed becomes so great that the boundary between the bed and the gas above it becomes indistinct.

**Dimictic** → A term to describe a lake whose thermocline is disrupted due to two periods of free circulation or overturn per year in the lake.

**Dioxin Tetrachlorodibenzoparadioxin (TCDD)** → A highly toxic and environmentally persistent product of the manufacture of the pesticide 2,4,5-T.

**Direct contact condenser** → The vapor stream is in direct contact with the drying medium, hot air or gas. The drying medium (hot air or flue gas) leaves the drier with the water vapor coming from the sludge. The drying temperature is 80 – 150 °C.

**Directivity index** → The difference between the measured sound power level and the value based on the assumption of uniform radiation in all directions.

**Discrete settling** → Particles settle as independent units, without interaction of flocs.

**Disinfection** → The removal or inactivation of pathogenic organisms.

**Dissolved oxygen** → A measure of the amount of oxygen dissolved in water, expressed as either:

(i) mg/l – which is the absolute amount of oxygen dissolved in the water mass

(ii) as percentage saturation of the water with O<sub>2</sub> (% sat)

**Dissolved solids** → The total colloidal and suspended solids in a liquid. Any particle passing a 1.2 µm filter is defined as dissolved.

**Dominant group** → The highest ranking group in a social order of dominance sustained by aggressive or other behavioural patterns.

**Downflow column** → e.g. Sand filtration where water flows through the filter by gravity. Also used in anaerobic digestion, where the wastewater enters at the upper levels and flows down through a packed medium. Opposite to upflow column.

**Downwash** → The drawdown of a plume after emission due to a low pressure area downwind of the stack.

**Dry absorption** → A method of controlling acids in flue gas emissions, by injection of dry calcium hydroxide into the gases leaving the furnace of an incinerator.

**Dry weather flow** → The combination of wastewater and dry weather infiltration flowing in a sanitary sewer during times of low precipitation.

**Ecology** → That branch of science dealing with living organisms and their surroundings.

**Ecosystem** → A community of interdependent organisms together with the environment which they inhabit and with which they interact, e.g. a pond.

**Ecotron** → A controlled, in-house, ecological experiment to recreate a particular ecosystem.

**ECU** → The EU unit of monetary currency.

**Effluent** → The outflow from a sewage treatment plant.

**Electrical double layer** → A name given to the combination of the Stern layer and the diffused layer of both negatively and positively charged ions which surround it.

**Electron** → Negatively charged particle contained within an atom, the weight of which is about two thousand times less than that of the hydrogen atom.

**Electrostatic precipitation** → A means of purifying an air stream by attraction and adhesion of ionized particles to an electrode.

**Element** → A substance, the molecules of which have all the same atoms.

**Endotoxin** → An environmental toxin which attacks the endocrine glands, i.e. kidney, liver, etc.

**Environmental impact assessment (EIA) → A review to which all commencing projects must be subjected with regard to their impact on the environment.**

**Enzyme → A substance produced by living cells which acts like a catalyst in promoting reactions within the organism.**

**Epilimnion → The zone in a stratified lake just below the near-surface water in which temperature decreases rapidly with depth.**

**Epilithic → Relating to organisms growing on rocks or on other hard, inorganic substances.**

**Equilibrium concentration → The concentration of the dissociated ions when the rates of both backward and forward reactions are equal.**

**Equilization basin → A holding tank within which variations in sewage inflow rate and liquid nutrient concentrations are averaged.**

**Equivalence → The number of protons donated in an acid-base reaction or the total change in valence in an oxidation-reduction reaction.**

**Eucaryotic cell → A cell whose nucleus is enclosed by a membrane, e.g. algae, higher plants and animals.**

**Euphotic zone → The surface zone of large lakes through which sufficient light penetrates for photo-synthesis to occur.**

**European Communities (EC) → A precursor to the EU, created by the merger of the European Coal and Steel Community, the European Economic Community and the European Atomic Energy Community.**

**European Economic Community (EEC) → An organization established in 1957 under the Treaty**

of Rome to co-ordinate the activities of its member countries in the coal and steel industry, the establishment of a common market and the pooling of atomic energy resources.

**European Union (EU) → A supranational organization which replaced the EEC in 1993, with the objective of peace and prosperity for its members by achieving complete economic and political union.**

**Eurytopic → A term describing an organism which is tolerant of a wide range of habitats.**

**Eurotrophic → A term describing freshwater bodies which are rich in plant nutrients and therefore highly productive.**

**Eutrophication → An increase in the concentration of nutrients in an aquatic ecosystem, causing:**

**(i) the increased productivity of autotrophic green plants, leading to the blocking out of sunlight**

**(ii) elevated temperatures within the water body**

**(iii) depletion of the world's oxygen resources**

**(iv) increased algal growth**

**(v) reduction in the level of and variety of fish and animal**

**Evaporation → The changing of liquid water from rivers, lakes, bare soil and vegetative surfaces into water vapor.**

**Evapotranspiration → A collective term for all the processes by which water in the liquid or solid phase at or near the earth's land surfaces becomes atmospheric water vapor.**

**Exothermic reaction** → A chemical reaction during which heat is liberated.

**Extended aeration** → Involves an aeration period of more than 24 hours and a high rate of return sludge to allow cell decay during the endogenous respiration phase of the growth curve.

**Facultative aerobes/anaerobes** → Having the ability to live either with or without oxygen.

**Fickian diffusion** → Molecular diffusion, governed by Fick's law, which says that the rate of flow of molecules across a unit area of a certain plane is directly proportional to the concentration gradient.

**Field capacity** → The amount of water which can be held in the soil against the force of gravity, i.e. Water which will not drain freely out of the soil.

**Filtration** → A process whereby suspended and colloidal matter is removed from water and wastewater by passage through a granular medium.

**Five-day biochemical oxygen demand (BOD<sub>5</sub>)** → A measure of the amount of oxygen used by bacteria to degrade organic matter in a sample of wastewater over a 5 day period at 20 °C, expressed in mg l<sup>-1</sup>.

**Fixed bed** → A bed of dry carbon which recovers volatile organic carbons from an air stream.

**Flagellae** → Whiplike structures of 100 – 200 μm length which allow bacterial mobility by undulating in planar or helical waves.

**Flash point** → The lowest temperature at which a flammable vapor/air mixture exists at the surface of a combustible liquid.

**Flocculation** → The water treatment process in which particle collisions are induced in order to encourage the growth of larger particles.

**Flotation** → A process by which suspended matter is lifted to the surface of a liquid to facilitate its removal. Frequently done by the bubbling of air through the liquid.

**Flow duration curve** → A means of summarizing temporal variability by averaging precipitation over a selected time period.

**Flowing well** → When the groundwater is flowing in a confined aquifer, it is under hydrostatic pressure. Should a standpipe be inserted into the aquifer, the water will rise in the standpipe.

**Flue gases** → Gas by-products of the incineration process whose temperature is a measure of incinerator efficiency and whose constituents may be polluting.

**Flue gas scrubber** → Equipment used for the removal of suspended particulates and acid gases from flue gas emissions.

**Fluidized bed combustion** → An incineration technique in which waste is destroyed by combustion on a bubbling bed.

**Fluoridation** → The addition of fluoride to drinking water within the limits 0.7 – 1.2 mg/l to help prevent the occurrence of tooth decay.

**Foaming agent** → Anti-foaming chemicals added to wastewater in the aeration tank to disperse the contaminating foam caused by the action of the surface aerators and the presence of detergents in the wastewater.

**Food/micro-organism ratio (F/M)** → A measure of the organic loading rate of a wastewater treatment system, i.e. the ratio between the daily



**BOD load and the quantity of activated sludge in the system (microbes).**

**Fugitive emissions → Emissions from non-point sources, e.g. loading/unloading, transferring, trans-  
porting, storing and processing of materials.**

**Fumigating → A term describing a plume from an emission stack which is trapped by a stable inversion above the stack mouth, thereby hitting the ground level very close to the stack.**

**Functional group → A group of atoms on which the characteristic properties of a particular homologous series depends, e.g. the alkanes, alcohols and esters.**

**Furans → Compounds causing chloracne, liver damage and liver cancer. Strictly  $C_4H_4O$ , but more commonly one of a range of polychlorinated dibenzofurans that are produced as contaminants from the incomplete incineration of chlorinated hydrocarbons.**

**Gamete → A mature cell, involved in reproduction.**

**Gas chromatography → A process whereby compounds become separated by being physically carried by a gas over a liquid of a high molecular weight.**

**Gas flaring → The burning of recovered landfill gas from a stack under controlled conditions to help eliminate the discharge of harmful constituents to the atmosphere.**

**Gasification → A high temperature process involving the decomposition of organics in the absence of oxygen. Some of the energy stored as chemical energy from the organic material will be released as burnable gas.**

**Genotype → The genes which an organism possesses or the genetic make-up of an organism.**

**Groundborne vibrations** → Vibrations caused by the reaction of tyres of heavy vehicles with irregularities in the road surface.

**Groundwater** → Water under a pressure greater than atmospheric pressure which is present in the saturated zone of the soil.

**Haematin** → A group of colored plant pigments, including the red pigment, haematochrome.

**Haloform** → A basic organic unit of the halogen group.

**Halogen** → The reactive members of Group 7 of the Periodic Table, including chlorine, bromine, fluorine and iodine.

**Hardness in water** → The sum of the calcium and magnesium ion concentrations. A hard water will leave a scale on the inside of kettles and will form a scum rather than a lather with soap.

**Hazardous waste** → A substance which exhibits ignitability, reactivity, corrosivity, and/or toxicity.

**Heat of adsorption** → Adsorption is the process of retaining a gas molecule by either physical or chemical means onto an adsorbent (a solid, e.g. activated carbon). The heat change taking place during this process (loss of heat of gas, increase in temperature of adsorbent) is the heat of adsorption.

**Heat of condensation** → The quantity of heat required to bring about a phase change from a gas to a liquid.

**Heat of solution** → The heat change which takes place when one mole of a substance is dissolved in excess solvent.

**Heavy metal** → Inorganic species of large atomic weight. Usually chromium ( $\text{Cr}^{3+}$ ), lead ( $\text{Pb}^{2+}$ ),

**mercury ( $\text{Hg}^{2+}$ ), zinc ( $\text{Zn}^{2+}$ ), cadmium ( $\text{Cd}^{2+}$ ) and barium ( $\text{Ba}^{2+}$ ).**

**Herbivores → Animals which feed on plant material only, e.g. rabbits.**

**Heterotrophic → A term applied to organisms which need ready-made food materials from which to produce their own constituents and to obtain all their energy.**

**High rate aeration → An increased rate of aeration of MLSS in an activated sludge system requiring less activated sludge and shorter aeration periods.**

**Homogenous → Consisting of only one phase.**

**Humus → The vegetative upper layers of the soil.**

**Hydraulic conductivity → See permeability.**

**Hydrograph → A graph of stream discharge versus time.**

**Hydrolysis → The breakdown of high molecular compounds to low molecular compounds.**

**Hydrophilic → Displaying an affinity for water.**

**Hydrophobic → Displaying an aversion for water.**

**Hydrothermal vent → An opening in the earth through which heated or superheated water is ejected.**

**Hydraulic jump → An area of turbulence and of loss of energy associated with the transmission from shooting to tranquil flow.**

**Hydrological cycle → The endless recirculatory transport process of the earth's water resources, linking the atmosphere, the land and the oceans.**

**Hyetograph** → A graph of water input to a catchment versus time.

**Hypha** → A tubular filament which is the basic unit structure of most fungi and some bacteria.

**Hypolimnion** → The lower layer of water in stratified lakes which retains the winter temperature.

**Ion** → Atoms or groups of atoms which have either lost or gained electrons and so have become either positively or negatively charged.

**Ion exchange** → Ion exchange can be illustrated by the following reaction:  $\text{Ca}^{2+} + \text{Na}_2\text{Z} \rightarrow \text{CaZ} + 2\text{Na}^+$ .

**Incineration** → Chemical oxidation at high temperatures where organic material is converted into heat energy, flue gas and slag.

**Inclusion body** → Organic or inorganic bodies containing glycogen, protein or lipids, present in the cytoplasm of a bacterium.

**Indirect contact condenser** → A condenser in which there is no direct contact between the heating medium and the vapor stream, but a partition divides the two. The water vapor is removed separately from the heating medium. The drying temperature is 100 – 250 ° C.

**Invertebrate** → Animal without cranium and spinal column.

**Irrigation requirement** → The difference in volume between effective precipitation and evapotranspiration.

**Isohyet** → A line on a map connecting areas of equal precipitation.

**Isocyanate** → Derivatives of nitrogen-substituted carbamic acids, containing carbon, oxygen and an organic amine group.

**Isotropic** → A substance whose physical properties are the same in all directions.

**Jute** → Fiber from the bark of some plants, used mostly for sacking.

**Karst** → Landforms of chemically weathered limestone, characterized by underground channels and caverns, swallow holes and open joints.

**Ketone** → An organic compound containing three carbon atoms, one of which is double-bonded to an oxygen atom, the other two each attached to three hydrogen atoms e.g. acetone.

**Landfill** → A repository in the ground for unwanted waste.

**Landfill gas** → This is produced principally from the anaerobic decomposition of biodegradable organic waste and includes ammonia, carbon dioxide, carbon monoxide, hydrogen, hydrogen sulfide, methane, nitrogen and oxygen.

**Landfill liner** → Used to limit the movement of leachate and landfill gases from the landfill site. Can be made of natural clay material or composite geomembrane and clay materials.

**Lapse rate** → The rate of temperature change with height for a parcel of dry air rising adiabatically.

**Latent heat of evaporation** → The quantity of heat required to bring about a phase change from a liquid to a vapor.

**Leachate** → Liquid, composed of external rainfall, groundwater, etc. which has percolated through solid waste and has extracted both biological and chemical, dissolved or suspended materials.

**Legumes** → Legumes are specific plants, e.g. clover, soybeans and lupins, which carry nodules on their roots and, together with bacteria of the genus

**Rhizobium** are responsible for the biological fixation of nitrogen in the soil.

**Life cycle assessment (LCA)** → The assessment of the steps in a product life cycle, including: raw materials acquisition, bulk material processing, materials production, manufacture, assembly, use, retirement and disposal.

**Ligand** → Molecules of a complexing agent in a complex ion, i.e. an aggregate formed when a metal ion bonds to several other ions or molecules which cluster around it. In the reaction  $\text{AgCl} + 2\text{NH}_3 \rightarrow \text{Ag}(\text{NH}_3)_2^+ + \text{Cl}^-$ ,  $\text{NH}_3$  is the ligand.

**Light compensation point** → The depth in a sea or lake below which, because of low light intensities, plants use up more organic matter in respiration than they make during photosynthesis.

**Liquid injection incineration** → A method of incineration of liquid waste by high-rate injection into a combustion chamber.

**Lithotrophic** → A term describing organisms which use inorganic compounds as electron donors in their energetic processes.

**Littoral zone** → The shore of a lake to a depth of about 10 meters.

**Lofting** → A term describing a plume from an emission stack which remains aloft due to a stable inversion below the mouth of the stack.

**Lower explosive limit (LEL)** → The concentration at which a gas forms an explosive mixture with air.

**Lysis** → The rupture of cells.

**Magnetic separation** → A process which utilizes the magnetic properties of ferrous metals to extract them from the waste stream.

**Masking agent** → A substance which will remove an offending odor from an air stream by decomposition or conversion to an organic salt.

**Materials recovery facility (MRF)** → Depots where reusable waste material is recovered.

**Mean cell residence time (MCRT)** → The average time a single microbe will remain in an activated sludge system and is calculated by: Total mass of cells/Rate of cell wastage.

**Meiosis** → A type of cell nuclear division in which the daughter nuclei receive only half the original number of chromosomes in the parent nucleus.

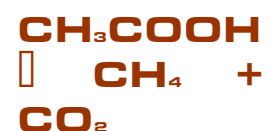
**Membrane process** → The removal of dissolved solids from water by passage through a membrane of minute pore diameter ( $3 \times 10^{-10}$  m).

**Mesophilic temperatures** → Those temperatures in the range 10 – 45 °C.

**Mesotrophic** → A term to describe waters having intermediate levels of the minerals required by green plants.

**Methanogenesis** → Intermediate compounds are converted to the final products of methane and carbon dioxide.

**Methanogenic bacteria** → Obligate anaerobes and methanobacteria (e.g. methanosarcina, methanobacilli) which produce methane gas from the decomposition of acids and alcohols:



**Micro-organisms** → Neither plant nor animal, these are small, simple organisms which are either unicellular or multicellular, consisting of protozoa, algae, fungi, ricettsiae, viruses and bacteria.

**Mineralization** → The process by which organic N is reconverted to mineral form by a wide variety of heterotrophic organisms – bacteria, fungi and actinomycetes.

**Mixed liquor suspended solids (MLSS)** → The microbial suspension in the aeration tank containing living and dead micro-organisms and inert biodegradable matter, the operating concentration of which may vary in the range 1500 to 4000 mg/l

**Mole** → A mole of any substance is that amount of it which contains the Avogadro Constant number of particles. A mole of any substance is equal to its molecular mass or atomic mass expressed in grams.

**Molecular diffusion** → The drifting of molecules under random kinetic motion from a low concentration region to a high concentration region.

**Monomielic** → A term to describe a lake having a single period of free circulation or overturn per year.

**Morphology** → The study of the form of animals and plants.

**Mouse system** → Software for the hydrodynamic and hydrochemical design of a wastewater collection system from the Danish Hydraulic Institute.

**Mutagenic** → Causing alteration of the genetic material of an organism, leading to inherited differences.



**Mycelium** → A mat of branching hyphae found particularly in actinomycetes.

**Negative project** → A commencing project for which an Environmental Impact Assessment will not be required.

**Negative sorting** → Manual sorting of waste to remove the unwanted fractions. Is recommended only for dry waste.

**Neutrality** → An ion or ion group which has an equal number of electrons and protons, i.e. neither a positive nor negative overall charge.

**Niche** → The ecological role of a species in a community.

**Nitrification** → The conversion of the ammonium ion,  $\text{NH}_4^+$ , into the nitrite ion,  $\text{NO}_2^-$ . It occurs in two steps:

(i)  $2\text{NH}_4^+ + 3\text{O}_2 = 2\text{NO}_2^- + 2\text{H}_2\text{O} + 4\text{H}^+$  by the bacteria genus *Nitrosomonas*

(ii)  $2\text{NO}_2^- + \text{O}_2 = 2\text{NO}_3^-$  by the bacteria genus *Nitrobacter*.

**Non-point source pollution** → Pollution from diffuse and not easily identifiable sources, e.g. a field.

**Normality** → A concentration unit which is defined as: number of equivalents of solute/number of liters of solution.

**Nucleic acid** → See Deoxyribose nucleic acid and Ribonucleic acid.

**Nucleoid** → An irregularly shaped region in the procaryotic cell containing the genetic material.

**Nucleus** → The well-defined region surrounded by the cell wall which contains the chromosomes, i.e. the materials of inheritance of the cell.

**Nutrient removal** → Tertiary treatment introduced to remove some of the trace compounds and elements contained in most domestic wastewaters, e.g. inorganic ammonia, nitrates, phosphates and sulfates, which are little affected by conventional treatment processes.

**Octave band** → The interval between a given frequency and twice that frequency within the audible frequency range.

**Odor threshold** → The minimum level or value of an odor necessary to elicit a public response.

**Off-specification stock** → Stock which is produced by errors in processing, leading frequently to customer dissatisfaction.

**Olfactometer** → An instrument used to measure relative odour levels.

**Oligotrophic** → A term describing freshwater bodies which are poor in plant nutrients and are therefore unproductive.

**Open loop recycling** → The manufacture of a new and simpler product from a retired, downcycled, more complex product.

**Organochlorine** → A highly persistent and carcinogenic compound containing one or more chlorine atoms found in pesticides such as DDT.

**Organoleptic parameters** → These are properties which can be detected by the human senses – eyes, nose and mouth.

**Organotrophic** → A term describing organisms which use organic compounds as electron donors in their energy-producing processes.

**Overflow rate** → The rate at which water is drawn off from the surface of primary and secondary clarification tanks. It is an important tank design

**parameter** and is derived from the analysis of settling particles.

**Overland flow** → The lateral movement of water over the ground surface due to gravitational forces.

**Oxidizing waste** → A waste which loses electrons in an oxidation-reduction reaction, thereby becoming reduced itself.

**Oxidation** → A process in which there is loss of electrons from an element or ion.

**Oxidation ditch** → A ring-shaped channel, 1 – 1.5 m deep, around which wastewater circulates at 0.3-0.6 m/s<sup>-1</sup>, is aerated by mechanical rotors and undergoes biological treatment by the resident microbes.

**Oxidation number** → The charge which an atom of an element has, or appears to have, in a compound, e.g. chlorine has an oxidation number of – 1.

**Oxygen sag curve** → The longitudinal profile of oxygen concentration in a river.

**Ozone** → A triatomic gas, particularly prevalent in the stratosphere, formed by the reaction:



**Ozone-depleting gases** → Gases (e.g. oxides of nitrates, chlorine nitrate, halocarbons and water vapor) which cause destruction of the ozone layer, thereby allowing increased amounts of sunlight to reach the earth.

**PAH** → Polycyclic aromatic hydrocarbons.

**PAN** → Peroxyacetyl-nitrate.

**Parasite** → An organism which lives on or in another living organism of a different species (the

host), from which it obtains food and protection, e.g. tapeworms, greenflies.

**Parr** → Fry, i.e. young fish.

**Partial pressure** → The pressure a single gas within a contained mixture of gases would exert if it were the only gas in the container.

**Peat bed filter** → Odorous compounds are removed from an air stream by passage through a bed of uncompacted peat from the upper layer of a bog.

**Percentage exceedance** → The inverse of the return period, i.e. a frequency (e.g. 90 percent) of occurrence of a flood event or rainfall whose associated depth is exceeded that percent (90 percent) of the time.

**Periplasmic space** → A space between the plasma membrane and the outer membrane of a biological cell, sometimes filled with a loose network of peptidoglycan.

**Permanent wilting point** → The water content of the soil beyond which plants cannot exert sufficient suction to extract moisture.

**Permeability** → The rate at which a fluid flows through a porous medium under the hydraulic head operating within the medium. Usually, the greater the porosity, the greater the permeability.

**Pesticide** → A material used for the mitigation, control or elimination of plants or animals detrimental to human health or economy.

**pH** → A measure of the acidity or basicity of a solution i.e. the negative of the logarithm of the hydrogen ion concentration.

**Phagocytose** → Ingestion of solid particulate matter by a cell.

**Phenol** → An organic compound with a hydroxyl (OH) group bonded directly to a benzene ring.

**Phenotic compound** → Compounds containing a phenol group, i.e. those containing hydrogen, six carbon atoms joined by alternating single and double bonds, and a hydroxyl group attached to the first carbon atom.

**Photo-oxidation** → Oxidation initiated by sunlight.

**Photolytic process** → A process in which radiant energy causes chemical decomposition.

**Phototropic** → An orientation response to light.

**Physico-chemical parameters** → Instrumental methods of analysis such as turbidimetry, colorimetry, polarography, adsorption spectrometry, spectroscopy and nuclear radiation.

**Physiology** → The science of functioning of living organisms.

**Phytoplankton** → Plankton consisting of photosynthesising plants, such as algae.

**Plasma arc destruction** → A method of incineration in which very hot plasma, heated by the conversion of electrical to thermal energy, pyrolyses and atomizes waste.

**Plasma membrane** → A membrane of 5 – 10 nm containing proteins and lipids, surrounding the cytoplasm of all cells.

**Plastid** → A membrane-bounded body found in the cytoplasm of most plant cells. See chloroplast.

**Point-source pollution** → Pollution from sources which are easily identified, e.g. slurry tank.

**Pollination** → The transfer of pollen, usually by insects or wind, from the anther of a stamen (male part of the flower) to the stigma of a carpel (female part of the flower).

**Polyampholite** → A type of polymer.

**Polyaromatic compounds (PAHs)** → Long chain compounds, very persistent in nature, containing the hydroxyl group in a cyclic structure.

**Polychlorinated biphenyls (PCBs)** → A generic term covering a family of chlorinated isomers of biphenyl found in sewage outfalls and industrial and municipal solid wastes.

**Polyelectrolytes** → Long-chain molecules used in the conditioning of sludge which, by neutralizing surface charges, cause bridging across fine particles or flocs to form larger particles.

**Polymer** → Giant molecules built up from thousands of smaller molecules, combined together to form a repetitive structure.

**Porosity** → The proportion of void spaces in the soil. The porosity of fine soils, e.g. clay, is low, whereas that of coarser gravelly soils is higher.

**Positive project** → A commencing project for which an Environmental Impact Assessment is considered essential.

**Precipitation** → The depth of rainfall plus the water equivalent of snow, sleet and hail falling during a given measurement period.

**Precipitation reaction** → A physical or chemical reaction which results in the precipitation of one of the products formed.

**Predator** → An organism which lives by killing and consuming other living things, e.g. sparrows, rabbits.

**Primary consumer** → Organisms which feed directly on the primary producers. These include herbivores, detritus feeders, scavengers and decomposers (animals which feed on dead plant remains).

**Primary pollutant** → Air pollutants which are emitted from an identifiable source, e.g. carbon monoxide from the car engine.

**Primary producer** → Organisms which are capable of using solar energy to make food by the process of photosynthesis, e.g. plants.

**Primary succession** → An ecological succession commencing in a habitat or on a substrate that has never previously been inhabited.

**Procaryotic cell** → A cell which lacks a distinct nucleus, e.g. bacteria.

**Profundal zone** → The zone of a lake lying below that depth at which the light compensation point occurs.

**Project thresholds** → Pre-determined levels relating to project size, production or site required which, if exceeded by a commencing project, define the necessity for an Environmental Impact Assessment.

**Protista** → The microbial kingdom to which unicellular or cell groups of eucaryotic organisms which lack true tissues, e.g. protozoa, belong.

**Protozoa** → Aquatic, free-living and parasitic organisms, these are the most basic of all animals, with only one single cell and measuring no more than 5 – 1 000 µm in size.

**Proteins** → Substances containing the elements carbon, hydrogen, oxygen, nitrogen and occasionally sulfur, whose main function is cell growth and repair.

**Proton → Positively charged particle contained within the nucleus of an atom.**

**Protoplasm → The living matter of a cell, comprising both the nucleus and the cytoplasm.**

**Pseudopodium → A temporary protrusion of cytoplasm from the surface of a cell which serves for both cell motion and ingestion.**

**Psychrophilic temperatures → Those in the range 0 – 10 °C.**

**Pyrolysis → A high temperature process involving the decomposition of organics without oxygen, air or steam. Burnable gas is released as a by-product.**

**Quench tank → A tank containing water to cool ashes and unburned materials which fall from the grates into a residue hopper during combustion.**

**Radiation → The emission of rays and particles characteristic of radioactive substances.**

**Radical → An element or atom, or group of these, normally forming part of a compound and remaining unaltered during that compound's ordinary chemical changes.**

**Radioactive cloud → An artificially generated atmospheric cloud containing radioactive compounds.**

**Rapid gravity filter → A filter used in water treatment which removes suspended solids from water by passing it through a sand bed, where the solids collect as a surface mat and in the sand interstices. The water should previously have been treated by coagulation, flocculation and sedimentation.**

**Recharge → The process of renewing underground water by infiltration.**



**Redox potential** → The oxidizing or reducing power of a reactant.

**Reduced groundwater** → Groundwater which contains no oxygen.

**Reduction** → A process in which an atom or ion gains electrons.

**Regeneration rate** → The rate of reproduction of bacteria, the method of which is usually by binary fission.

**Regolith** → All loose earth material above the underlying soil rock.

**Retention time** → The length of time a wastewater remains in a clarification tank, an important design parameter in the optimization of settling of suspended solids.

**Return activated sludge** → Settled activated sludge from the clarifier which is returned to the aeration tank to ensure an active population of microbes will be mixed with the incoming wastewater.

**Return period** → The long-term average of the intervals between successive exceedances of a flood magnitude.

**Reverse osmosis** → A membrane process in which solutions of two different concentrations are separated by a semi-permeable membrane. An applied pressure gradient greater than the osmotic pressure ensures flow from the more concentrated to the less concentrated solution.

**Reynold's number** → The ratio of inertial to viscous forces in a fluid, the value of which will determine whether the fluid flow is turbulent or viscous.

**Ribonucleic acid (RNA)** → A large organic molecule found in the cell cytoplasm containing a phosphate,

**five-carbon sugars (ribose) and four nitrogenous bases in a repetitive structure.**

**Ribosomes → Tiny bodies containing RNA responsible for protein synthesis and found in the bacterial cell cytoplasm.**

**Riffle area → An area of the river bed covered by grains of too large a size and weight to be carried by the water and so were dispersed.**

**Root zone → The soil layer from which plant roots can extract water during transpiration.**

**Rotary screen → See trommel.**

**Rotary kiln incineration → A process by which waste enters an inclined, rotating kiln, is mixed with air and combusted.**

**Rotating biological contactor → A form of biological treatment in which fixed media is grown on circular discs mounted on a horizontal axle. These discs are partially submerged in wastewater while the axle rotates, allowing bio-oxidation of the wastewater, using oxygen from the air.**

**Roughing filter → A high-rate trickling filter of depth 1 – 2m, hydraulic loading  $10-40\text{m}^3/\text{m}^2/\text{d}$  and organic loading  $0.32 - 1.0\text{ kgBOD}/\text{m}^3/\text{d}$  through which wastewater may be passed prior to an activated sludge treatment.**

**Salmonoids → Belonging to the salmon family, Salmonidae.**

**Saprophytic → An organism which obtains food by absorbing dissolved organic materials resulting from organic breakdown and decay.**

**Schmutzdeck → The surface mat of suspended particles which forms on the surface of a slow sand filter.**

**Scoping → The second stage of an Environmental Impact Assessment which decides the key issues for review within the EIA.**

**Screening → (i) The final sorting stage necessary for high-quality compost, during which uncomposted particles such as wood, glass or plastic are removed by passing through a fine mesh. (ii) The first stage of an Environmental Impact Assessment (EIA) in which the projects to be subjected to an EIA are chosen.**

**Scrubbing → A process by which suspended particles and acid gases are removed from a flue gas stream, the former by absorption onto liquid droplets and the latter by diffusion into the liquid phase.**

**Scum well → A box used to store the scum which forms on the surface of a wastewater in a clarification tank. Scum is usually drawn off by a horizontal, slotted pipe that can be rotated by a lever or a screw.**

**Secondary consumers → Organisms which feed on the herbivores or other primary consumers, e.g. foxes, lions.**

**Secondary pollutant → Air pollutants which are formed in the atmosphere by chemical reactions, e.g. ozone.**

**Secondary production → The assimilation of organic matter by a primary consumer.**

**Secondary succession → An ecological succession that takes place in an area where a natural community**

**existed and was removed.**

**Selective catalytic reduction (SCR) → A pre-combustion method of decomposition of NO, in an ajar stream to nitrogen and water by injection of**

**ammonia into the catalytic bed of a combustion chamber.**

**Selective non-catalytic reduction (NSCR) → A post-combustion method of decomposition of  $\text{NO}_x$  in an air stream to nitrogen and water by injection of ammonia downstream of a combustion chamber.**

**Semi-dry absorption process → A method of controlling acids in flue gas emissions, by injection of a calcium hydroxide and water solution into the gases leaving the furnace of an incinerator.**

**Sensible heat → That portion of the heat radiated by the sun which is required to heat the earth.**

**Sensitive area → A water body which may intermittently suffer eutrophication.**

**Sequencing batch reactor → A time-stepped batch process for the biological treatment of liquid hazardous waste.**

**Sere → A term used to describe a succession of communities, each following one after the other and finally reaching a stable state.**

**Settling chamber → The purification of an air stream by reducing the velocity of the gas so that the particles drop out by gravity.**

**Settling tank → A rectangular or circular tank in which particle velocities within the liquid are sufficiently reduced to allow the suspended material to be removed from the liquid by gravity settling.**

**Settling velocity → This is the velocity at which a particle will fall to the bottom of a settling tank and is equal to the surface overflow rate for a rectangular tank.**

**Severance** → The physical or psychological division of an existing community or property due to traffic development.

**Sewage** → Wastewater and other refuse such as faeces, carried away in sewers.

**Sewerage** → System of pipes and treatment plants which collect and dispose of sewage in a town.

**Sheath** → A hollow, tubelike structure found in most bacteria surrounding a chain of cells.

**Sisal** → Strong, durable white fiber of agave used in the making of ropes.

**Slag** → The fused bottom ash produced by the incineration process containing incombustibles, the ash fraction of combustibles and any undestroyed pollutants.

**Sloughing** → A term which describes the falling off of the slime layer of micro-organisms on the media of a trickling filter due to the development of anaerobic conditions and lack of food caused by an increase in slime thickness.

**Slow sand filter** → A filter which removes suspended solids from raw water by passing it through a sand bed, where the solids collect as a surface mat and in the sand interstices. Filtration rates are in the order of 2 – 5 l/m<sup>2</sup>/min.

**Sludge** → The accumulation of solids resulting from chemical coagulation, flocculation and sedimentation after water or wastewater treatment.

**Sludge bulking** → A phenomenon caused when a large number of filamentous micro-organisms present in the mixed liquor interferes with the compaction of the floc and produces a sludge with a poor settling rate.

**Sludge conditioning** → Addition of chemicals, polyelectrolytes or heat treatment to improve the rate of dewatering.

**Sludge dewatering** → The mechanical unit operation used to reduce the moisture content of sludge to 70 – 75 percent and thus ensure that the remaining sludge residue effectively behaves as a solid for handling purposes.

**Sludge stabilization** → The process of destroying or inactivating pathogens.

**Sludge volume index (SVI)** → A measure of the ability of sludge to settle, coalesce and compact on settlement.

**Smog** → Dense, smoky fog, the formation of which is promoted by reactions between unsaturated hydrocarbons and oxides of nitrogen in the presence of sunlight and under stable meteorological conditions.

**Soilbed** → A large tract of land, the microbes within which remove odorous compounds from an air stream

**Soil horizons** → The soil layers seen in a vertical soil profile, characteristic of soil-forming processes over time.

**Soil profile** → A vertical cut through the soil revealing a sequence of horizons.

**Soil suction** → Water pressure within a soil which is less than atmospheric pressure.

**Solid waste** → All the wastes arising from human and animal activities which are normally solid and are discarded as useless or unwanted.

**Solubility product** → The equilibrium constant for a reaction involving a precipitate and its constituent

ions, e.g. for magnesium sulfate  $\text{MgSO}_4 = \text{Mg}^{+2} + \text{SO}_4^{-2}$ , the solubility product =  $[\text{Mg}^{+2}][\text{SO}_4^{-2}]$

**Solute** → A substance dissolved in a fluid.

**Solution** → The conversion of a solid or gas into liquid form by mixing with a solvent.

**Solvent** → A liquid capable of or used for dissolving something.

**Sound exposure level (SEL)** → Used to express the energy of isolated noise events, the SEL is that constant level in decibels lasting for one second which has the same amount of acoustic energy as a transient noise.

**Sound intensity** → The average sound power per unit area normal to the direction of propagation of a sound wave.

**Sound power** → The rate, measured in watts, at which energy is transmitted by oscillating sound waves.

**Spates** → A river in flood.

**Specific flux** → A measure of rate of flow per unit area.

**Specific resistance to filtration (SRF)** → A laboratory-determinable wastewater sludge parameter.

**Spectrophotometry** → An instrumental method of measuring the intensity of light in various parts of the spectrum.

**Spore** → A unicellular or multicellular microscopic body involved in plant, bacteria and protozoan reproduction.

**Stable inversion** → On moving downwards through the atmosphere, a cool parcel of air becomes

heated and less dense than the surrounding air, thereby being pushed back up. It finds itself in a stable position – wanting neither to move up nor down.

**Stabilization pond** → A quiescent, diked pond in which wastewater undergoes biological treatment under microbial action.

**Stenotopic** → A term describing an organism which is tolerant of a narrow range of habit.

**Step feed aeration** → An aeration system in which a portion of the sewage load is added at each of several inlets, thus spreading out the oxygen demand over the length of the tank so that oxygen utilization is more efficient.

**Stern layer** → The innermost ion layer tightly attached to the surface of a colloidal particle.

**Stratosphere** → The temperature-constant region of the atmosphere above the troposphere which contains oxygen and ozone.

**Supernatant** → The partially purified water, high in suspended solids and ammoniacal nitrogen, which is released during the digestion process and whose quality and amount is dependent on the type and settling quality of the waste and on the digester system efficiency.

**Surface tension** → The minimization of the surface of a free body of liquid due to the unbalanced attractions exerted by the liquid and the air on the liquid surface molecules.

**Surge channel** → A channel or basin designed to take excess flow.

**Suspended growth** → The free-moving, aerobic, microbial culture used in the biological treatment of wastewater by the activated sludge process.



**Suspended solids** → Solids in suspension in a water or wastewater which can be removed by filtration.

**Suspension** → A substance consisting of particles suspended in a medium.

**Sustainable development** → Projects undertaken with care to preserve and manage resources, use genetic engineering with responsibility, search for technical alternatives to existing energy sources and control land, water and air pollution.

**Synoptic storm** → A storm covering several hundred miles, associated with frontal activity and/or intense low pressure centers.

**Synthetic organics** → Man-made, organic compounds, some of which are carcinogenic, including surfactants pesticides, cleaning solvents and trihalomethanes.

**Tapered aeration** → An aeration system which equalizes the quantity of air supplied to the demand for air exerted by the micro-organisms as the liquor flows through the aeration tank.

**Temperate climate** → A climate not exhibiting extremes of either heat or cold, e.g. the Irish climate.

**Tempering** → A process which brings metals to the proper hardness and elasticity by heating after quenching.

**Teratogenic** → Causing developmental malformations.

**Tertiary consumer** → Organisms which feed on secondary consumers, e.g. man.

**Thermal drying** → An operation which involves reducing the water content of sludge by vaporization of water to air, resulting in a granular

**dried product of 92 – 95 per cent dry solids concentration.**

**Thermal plume → Heated effluent from an outfall, usually less dense than the receiving water, causing increased growth rates and species changes due to local warming.**

**Thermocline → A horizontal temperature discontinuity layer in a lake in which the temperature falls by at least 1 °C per meter depth.**

**Thermophilic temperatures → Those in the range 45 – 75 °C.**

**Thickening of sludge → A process which facilitates disposal of sludge by increasing the solids content to approximately 4 per cent.**

**Thiocyanates → Pseudohalide ions, formed from the oxidation of a CN<sup>-</sup> group, containing an SCN<sup>-</sup> group.**

**Threshold of hearing →  $10^{-12} \text{ W/m}^{-2}$ , i.e. the lowest sound intensity to which the human ear can respond.**

**Toxin → A specific poison of biological organic origin.**

**Transfer station → A location to accomplish transfer of solid wastes from collection and other small vehicles to larger transport equipment, with the aim of economizing on waste transportation.**

**Transmissivity → A measure of the rate of flow of water through a water-bearing rock.**

**Trapping → A term describing a plume from an emission stack which is trapped by a stable inversion above the stack mouth, but due to mixing below the mouth level, hits the ground downwind rather than beside the stack.**

**Trickling filter** → A biological reactor in which micro-organisms, growing as a slime on the surface of fixed media, oxidize the colloidal and dissolved organic matter in wastewater using atmospheric oxygen which diffuses into the thin film of liquid as the wastewater is trickled over the slimed surfaces at regular intervals.

**Transpiration** → The loss of water vapor from the surface of the plant due to evaporation.

**Trommel** → A rotary screen used to separate out the various size fractions of municipal solid waste.

**Trophic levels** → One of the hierarchical strata of the food web characterized by organisms which are the same number of steps removed from the primary producers.

**Tropopause** → The interface between the troposphere and stratosphere.

**Troposphere** → The layer of atmosphere extending from the earth's surface to the stratosphere.

**Tubificid worm (*Potamothrix hummonensis*)** → A benthic worm, tolerant of low oxygen conditions, belonging to the genus *Tubifex*.

**Tundra** → A vast, level, treeless region with an arctic climate and vegetation.

**Turbidity** → The clarity of water, i.e. a measure of the accumulation of collidal particles, determined by light transmission through the water.

**Turbulent mixing** → When a flow of liquid or air becomes large, the streamlines become irregular and parcels of the flowing substance begin to move in a highly irregular path while maintaining a net downstream velocity.

**Ultrafiltration** → Filtration technique used in water treatment to separate out bacteria larger than 1 - 100 µm.

**Upflow column** → Where the water/wastewater flows upward under pressure through a column or tank, instead of downward by gravity. When used in water filtration, it is akin to the backwashing process in rapid gravity filters. Also used in aerobic digestion of industrial wastewaters where the column is packed with aggregate or synthetic material.

**Vadose zone** → The entire zone of negative water pressures above the water table, the lowest portion of which is permanently saturated by capillary rise.

**Valency** → The number of electrons which an atom of an element must either lose or gain to achieve a noble gas structure.

**Van der Waals forces** → The forces which exist between the molecules in a crystal.

**Vibrating screen** → Used to remove undersized components of municipal solid waste.

**Virion** → A mature virus.

**Volatile acid** → A fatty acid with, at most, six carbon atoms which are water soluble.

**Volatile solid** → Solids, frequently organic, which volatilize at a temperature of 550 °C.

**Vortex shedding** → Turbulent eddies which are shed from the downstream corners of buildings in a wind/water environment.

**Waste minimization** → The general trend in developed countries to reduce the quantities of waste material produced.

**Watershed** → Line between the headstreams of river systems, dividing one catchment from another.

**Water table** → The level of water within the soil at which the pore water pressure is equal to the atmospheric pressure.

**Wavelength** → The horizontal distance between two successive wave crests or between two Wave troughs or between any two corresponding points on the wave surface.

**Waveperiod** → The time taken for two successive wave crests or two wave troughs or any two corresponding points on successive waves to pass a fixed point in space.

**Wet oxidation** → A method whereby waste, either dissolved in water or emulsified, is oxidized at very high temperatures and pressures.

**Windrow** → A form of composting in which pretreated refuse is laid out in heaps with a triangular cross section of 2 – 3 m width at the base and a height of 2 m and turned at regular intervals.

**Zeta potential** → A measure of the charge on a colloidal particle.

**Zone settling** → Particles are so close together that interparticle forces hinder the settling of neighbouring particles, causing all the particles to remain in a fixed position relative to each other and to settle at a constant velocity.