Industry Glossary

Absolute humidity – Actual measurement of water vapor in the air.

Acid – Any substance that donates a proton (H+) when dissolved in a solution. In water treatment, it usually means circulating water with a pH of less than 7.0. Sulfuric acid is the most common acid used to control cooing water pH.

Adsorption – Assimilation of molecules or other substances onto the physical structure of a liquid or solid without chemical reaction.

Aeration – Blowing or mixing of air through water to sweep out other dissolved gases and to equilibrate the water with primarily nitrogen, oxygen and carbon dioxide.

Aerobe – An organism that grows only in the presence of free (molecular) oxygen.

Air cleaning – An IAQ control strategy to remove various airborne particulates and/or gases from the air. The three types of air cleaning most commonly used are particulate filtration, electrostatic precipitation, and gas sorption.

Air exchange rate – The rate at which outside air replaces indoor air in a space. Expressed in one of two ways: the number of changes of outside air per unit of time air changes per hour (ACH); or the rate at which a volume of outside air enters per unit of time – cubic feet per minute (cfm).

Algae – A low form of plant life containing chlorophyll that generally requires sunlight and air for existence. Many are microscopic but under favorable conditions can grow sufficiently dense to plug cooling tower distributors on the decks and to interfere with water splashing in the fill. Large masses often slough off the tower and plug heat exchangers or deposit in piping.

Algaecide – A toxic material that will kill algae. Some of the more commonly used algaecide are chlorine, copper sulfate and phenolic compounds.

Alkalinity – An expression of the total basic anions (hydroxyl groups) that is present in a solution. It also represents, particularly in water analysis, the bicarbonate, carbonate, hydroxyl and occasionally the borate, silicate, and phosphate salts which will react with water to produce acid neutralizable anions.

Ambient dew point – The ambient temperature in degrees Fahrenheit when dew begins to be deposited.

Ambient wet-bulb temperature – The wet-bulb temperature that is measured in accordance with the definition of ambient. Readings are obtained by means of a mechanically aspirated psychrometer.

Ammonia – A Water-soluble, colorless, pungent gas with the formula NH3.

Ammonium – Positive ion with the formula NH4+ that forms when ammonia dissolves in water. It adds non-natural alkalinity to the water.

Anaerobe (facultative) – An organism that can grow under either aerobic or anaerobic conditions.

Anaerobe (strict) – An organism that grows only in the absence of free oxygen (e.g., sulfate reducing bacteria).

Antimicrobial – Agent that kills microbial growth. See "disinfectant", "sanitizer", and "sterilizer".

BTU - British Thermal Units. The amount of heat it takes to raise one pound of water one degree Fahrenheit. The higher the BTU rating, the larger the heating capacity of the furnace or air conditioner.

Bacteria - Unicellular microorganisms which reproduce by fission or spores, identified by their shapes: coccus, round; bacillus, rod shaped; and spirillum, curved.

Bicarbonate Alkalinity - In a water solution, the presence of ions resulting from the hydrolysis of carbonates when these salts react with water. A strong base and a weak acid are produced and the solution is alkaline. Its formula is HCO3-, but its concentration is usually denoted as ppm as CaCO3.

Biocide – A chemical that is designed to control the population of troublesome microbes by killing them.

Biological deposit – Water-formed deposits of organisms or their waste products (example: slimes, barnacles, etc.).

Biological contaminants – Agents derived from, or that are, living organisms (e.g., viruses, bacteria, fungi, and mammal and bird antigens) that can be inhaled and can cause many types of health effects including allergic reactions, respiratory disorders, hypersensitivity diseases, and infectious diseases. Also referred to as "microbiologicals" or "microbials".

Blowdown – Water discharged from the system to control concentration of salts or other impurities in the circulating water.

Blow out – Water that is blown or pulled out of the air inlet by wind.

Building envelope – Elements of the building, including all external building materials, windows, and walls, that enclose the internal space.

Carbonate hardness – Hardness in water caused by bicarbonates of calcium and magnesium. If alkalinity exceeds total hardness, all hardness is carbonate hardness; if hardness exceeds alkalinity, the carbonate hardness equals the alkalinity.

Ceiling plenum – Space below the flooring and above the suspended ceiling that accommodates the mechanical and electrical equipment and that is used as part of the air distribution system. The space is kept under negative pressure.

Cell – The smallest tower subdivision which can function as an independent unit with regard to air and water flow; it is bounded by exterior walls or partitions. Each cell may have one or more fans or stacks and one or more distribution systems.

CFM – Cubic feet per minute. The amount of air, in cubic feet, that flows through a given space in one minute. 1 CFM equals approximately 2 liters per second (l/s).

Chemical dosage – The amount of chemical added to a system, usually expressed as ppm, or pounds of chemical per million pounds of water.

Chlorination – Adding chlorine or a chlorine derivative to water to prevent the growth of various organisms that cause biofouling.

Chlorination, dechlorination – The act of removing chlorine from water, usually via a reducing agent or strong aeration.

Chlorine – A poisonous yellow gas with chemical symbol C12 used for water treatment. It is soluble in water but can be removed by reducing aeration and reaction with sunlight.

Chlorine demand – The relation of the amount of chlorine to be added to a system to react with chlorine-oxidizable material until a free residual in a given system is achieved.

Circulating water rate – Quantity of water pumped from the basin to the equipment to be cooled, usually expressed as gallons per minute (gpm).

Cold water temperature (CWT) – Temperature of the water entering the cold water basin before addition of make-up.

Commissioning – Start-up of a building that includes testing and adjusting HVAC, electrical, plumbing, and other systems to assure proper functioning and adherence to design criteria. Commissioning also includes the instruction of building representatives in the use of the building systems.

Concentration – The process of increasing solids per unit volume of solution, usually by evaporation of the liquid; also, the amount of material dissolved in a unit volume of solution. This occurs due to evaporation that cools the water. It is normally expressed directly as ppm or indirectly as mhos conductivity.

Conductivity – The ability of water to conduct electricity. When measured with a standard apparatus, it is called specific conductivity and is a function of the total ionic dissolved solids. As a rule of thumb, TDS = 2/3 specific conductance measured as micromhos.

Constant air volume systems – Air handling system that provides a constant air flow while varying the temperature to meet heating and cooling needs.

Cooling efficiency – The percent of the temperature drop across the media compared to the Wet Bulb Depression. I.E. if the Wet Bulb Depression is 30 degrees (f) (as in the above example) and the actual temperature drop measured across the cooling media is 27 degrees (f), the cooling efficiency of the media is 90%. (27/30 = .90). The cooling efficiency is also referred to as “Saturation Efficiency” because it refers to the amount of moisture that is packed in the air. 100% Saturation Efficiency would indicate a temperature drop of 30 degrees (f) in the above example of wet bulb depression.

Cooling water – Water circulated through a cooling system to remove heat from certain areas.

Corrosion – To be dissolved away, usually by oxidation or acidification. This usually refers to metal loss in cooling systems, often recognized by the local reaction of the dissolved metal with oxygen, carbon dioxide, acids or galvanic action. May result in general (widespread) or pitting loss of the metal.

Corrosion inhibitor – Chemical used in a system to prevent corrosion.

Curtain drop – A failsafe device to mechanically release the sidewall curtain winch on power failure or in high temperature situations, causing curtains to fall open.

Cycles of concentration – Compares dissolved solids in makeup water with solids concentrated through evaporation in the circulating water. Since chlorides are soluble in water, for example, the cycles of concentration are equal to the ratio of chlorides in circulating water to chlorides in makeup water.

Deflocculation – The ability of some materials such as polyphosphides to peptize and disperse suspensions of colloidal particles.

Delignification – The dissolving of the lignin portion of cooling water wood usually by strong alkaline and/or oxidizing agents.

Dewpoint – The temperature at which moisture begins to form on a slick surface indicating 100% saturation of the air with moisture. That is how the dew gets on the grass in the morning. The dry bulb air temperature drops to the web bulb temperature level.

Direct mount pad system – A low-cost alternative to a doghouse plenum pad cooling installation, mounting pads with as little as a 6-inch gap over tunnel inlets. Direct mount systems are less efficient than doghouse plenum systems but can perform adequately when properly designed and installed. They are sometimes the only feasible way to add evaporative pad cooling to an existing house.

Disinfecting – To remove microorganisms from a particular surface or liquid.

Dispersant – A chemical that causes particulates in a water system to remain in or be placed into suspension.

Dissolved solids – Total solids that have been dissolved into a liquid. They may be ionic and/or polar in nature.

Distribution header – Pipe or flume delivering water from inlet connection to lateral headers, troughs, flumes, or distribution basins.

Distribution system – Those parts of a tower, beginnings with the inlet connection, which distribute the hot circulating, water within the tower to the points where it contacts the air. In a counterflow tower, this includes the header, laterals, and distribution nozzles. In a crossflow tower, the system includes the header or manifold, valves, distribution box, basin pan, and nozzles.

Doghouse plenum – A small structure, 18-24 inches wide inside, built onto the side of a poultry house opposite the tunnel air inlets and accommodating evaporative cooling pads. Also referred to as a “pad room”. These allow for air to pass through cooling pads at low velocity (for high cooling efficiency) before passing through the smaller area of the tunnel inlets. They also allow personnel entry for pad maintenance.

Downspout – A short vertically placed pipe or nozzle used in a gravity distribution system to divert water from a flume or lateral to a splasher.

Drift – Water lost as liquid droplets entrained in the exhaust air. It is independent of water lost by evaporation. Units may be in lbs./hr. or percentage of circulating water flow. Drift eliminators control this loss.

Drift eliminators – An assembly constructed of wood, plastic, cement board, or other material that serves to remove entrained moisture from the discharged air.

Dry Bulb – The ambient (surrounding air) temperature taken with a thermometer.

Electronic control – Integrated electronic controllers include sensors for temperature, static pressure and sometimes relative humidity; they are programmable to make ventilation setup adjustments without the need for resetting of individual thermostats, etc., and give more precise control of in-house conditions.

Entering air – Surrounding air from the atmosphere which enters through the louvers on an Induced draft or is discharged by a fan on a Forced Draft.

Entering wet-bulb temperature – Average wet-bulb temperature of the entering air. Includes any effects of recirculation.

Evaporation loss – Water evaporated from the circulating water into the atmosphere by the cooling process.

Evaporation rate – The rate at which water is absorbed into the air passing through the cooling media. For practical purposes, this rate is measured in gallons of water per hour (or minute).

Evaporative cooling – When water evaporates into the air, it has the effect of cooling the air. Evaporative cooling for poultry housing has been found feasible in all but the most humid climates. Water may be sprayed or fogged into the air, or blown over a medium saturated with water.

Evaporative cooling pad – A material on which water is applied which will allow air to pass through it, thus facilitating evaporation and reducing the air temperature. These can be paper or fiber and range from 2” to 6”. The angle and size of pad “flutes” or openings affect the cooling efficiency and static pressure drop across a pad. Pad choices must take these factors into consideration, along with pad area and air velocity needed through pad for desired cooling efficiency.

Exhaust air – The mixture of air and its associated vapor leaving the system (see Air Flow).

Exhaust ventilation – Mechanical removal of air from a portion of a building (e.g., piece of equipment, room, or general area).

Fan – A device for moving air. The fan design may be either an axial flow propeller or centrifugal blower. The fan can be applied as induced draft or forced draft.

Fan drive assembly – Mechanical components furnishing power to the fan, usually consisting of driver, drive shaft, speed reducer, and supporting members.

Fan driver input – Horsepower input to the driver. For 3-phase alternating current (ac) motors:

hp = (amps x volts x 3 x Power Factor x Efficiency) / 746

Fan driver output – Brake horsepower output of the driver to the drive shaft. Fan driver input x motor efficiency.

Fan guard – A protective screen installed either at the inlet of a forced draft fan or at the exit of an induced draft fan.

Fan pitch – The angle that a fan blade makes with the plane of rotation.

Float valve – A valve that is actuated by a float, generally used to control make-up water supply.

Flocculation – The process of agglomerating coagulated particles into settleable flocs, usually of a gelatinous nature.

Flow control valve – A manually controlled valve generally located in the hot water supply line used to increase or decrease the flow of a liquid in a system.

Fogging – A fog condition created when the exhaust air or plume from a cooling tower becomes supersaturated so that part of the water vapor condenses into visible liquid droplets.

Fogging nozzles – Fine droplet spray nozzles or misters used to introduce water vapor into an air stream for evaporative cooling. Most efficient nozzles deliver 1 gal/hr at 160-200 psi.

Forced air furnace – A direct fired heating furnace with built-in air blower used to maintain temperatures in the poultry house. These can be used alone or in conjunction with brooding equipment.

Fungi – Simple, plant-like life forms that lack true roots, stems, leaves, and chlorophyll. They are filamentous in structure (e.g., mushrooms, mildews, molds, and yeasts).

GPM – (abbr.) Gallons per minute.

Grains of moisture per pound of dry air – A method of measuring actual water vapor (moisture) in a pound of dry air, most often referred to as “humidity ratio”. I.E. 50 grains of moisture at 100 degrees (f) equals 12% relative humidity and 70 degrees (f) wet bulb at sea level.

Groundwater – Water pumped from underground rivers, wells, and lakes.

Half life – In water treatment, the time it takes to lose of a slug fed product from the system through blowdown, drift and windage when taking into account its continuous concentration by evaporation and dilution by fresh makeup.

Hardness, calcium – The calcium compounds dissolved in water, usually expressed as calcium carbonate.

Hardness, carbonate – The calcium and magnesium carbonate and bicarbonate dissolved in water, expressed as calcium carbonate. Other metallic cations such as ferrous iron, barium, zinc and manganous ions are also included.

Hardness, magnesium – Magnesium compounds dissolved in water, expressed as calcium carbonate.

Hardness, noncarbonate – The difference between the total hardness and the total alkalinity of a water.

Heat Pump – A unit that handles both heating and cooling. In some climates, a heat pump may handle your heating and cooling needs more efficiently than a furnace and air conditioner.

Impurities – Any substance that contaminates another.

Inlet air – (see Entering Air).

Louvers – Members installed horizontally in a system wall to provide openings through which the air enters the system while also containing the falling water within the system. Usually installed at an angle to the direction of air flow to the system.

Makeup – Water added to the circulating water system to replace water lost from the system by evaporation, drift, blowdown, and leakage.

Mechanical controls – Controls such as thermostats and timers. These are simple and inexpensive methods of control however, their accuracy is limited and they must be set individually.

Mechanical equipment support – Members which comprise the primary support for the fan, drive assembly. Normally steel or concrete.

Microorganism – An organism that is too small to be studied without the aid of a microscope.

Minimum ventilation – A wintertime ventilation mode designed to exhaust ammonia and moisture and bring fresh air into the house. Minimum ventilation is normally cycled by on-off timers, running as little as one minute in ten. Care must be taken not to under-ventilate in cold weather in an effort to save fuel.

Motor rated horsepower – Horsepower rating inscribed on name-late of the motor driving the fan. (See Rated Horsepower.) Unit: hp.

Negative pressure ventilation – Power ventilation in which in-house air is at a lower static pressure than the outside air, with air being pushed out of the building by exhaust fans. The partial vacuum created brings air into the building through all openings, planned or unplanned. A static pressure difference across the walls of at least 0.05 inches of water is required to ensure adequate air distribution throughout the building and avoid short-circuiting of airflow near the fans.

Nozzle – A device for controlled distribution of water in a cooling tower. Nozzles are designed to deliver water in a spray pattern by pressure or by gravity flow.

Outdoor air supply – Air brought into a building from the outdoors (often through the ventilation system) that has not been previously circulated through the system. Also known as “Make-Up Air”.

pH – (see Hydrogen Ion Concentration)

Plenum – Air compartment connected to a duct or ducts.

Positive pressure ventilation – Power ventilation, in which the interior air is at a higher static pressure than the outside air, with air being pushed into the building by intake fans in the walls, and exiting the house through all the openings in the walls or ceiling.

Pounds of moisture per pound of dry air – Same as grains except weight of water vapor (moisture) is expressed in pounds. In same example above, the pounds of moisture would equal .009 # per pound of dry air.

Power vent controls – An automatic control which adjusts air inlet opening size to maintain static pressure within ranges that allow proper airflow, thus resulting in desired air exchange rate and airflow pattern.

PPM – Parts per million.

Pressure, static – In flowing air, the total pressure minus velocity pressure. The portion of the pressure that pushes equally in all directions.

Pressure, total – In flowing air, the sum of the static pressure and the velocity pressure.

Pressure, velocity – In flowing air, the pressure due to the velocity and density of the air.

Preventive maintenance – Regular and systematic inspection, cleaning, and replacement of worn parts, materials, and systems. Preventive maintenance helps to prevent parts, material, and systems failure by ensuring that parts, materials and systems are in good working order.

Psychrometer – An instrument used primarily to measure the wet-bulb temperatures. Either a sling or a mechanically aspirated type of psychrometer is acceptable provided the instrument is properly shielded from radiation and the air across the wick is limited to approximately 1,000 ft/min.

Radiant heat transfer – Radiant heat transfer occurs when there is a large difference between the temperatures of two surfaces that are exposed to each other, but are not touching.

Re-entrainment – Situation that occurs when the air being exhausted from a building is immediately brought back into the system through the air intake and other openings in the building envelope.

Relative humidity – The percent of moisture in the air compared to the amount of moisture the air could contain. This is the most common reading to be reported in the weather reports. The report of “100 degrees and 12% relative humidity (RH)” is the same as all the above examples. Using the analogy of a glass half filled with water means the glass is 50% full. It could hold an additional 50% at which point it would start to overflow if more water was added.

Scale – The deposition on heat transfer surfaces of material normally in solution, as opposed to fouling, which is deposition of material normally in suspension.

Sidewall air inlets – Also called vent boxes, these inlets are spaced high along sidewalls for negative pressure non-tunnel mode ventilation. A modern house will have approximately 15 sq ft of inlet area per 10,000 cfm of fan capacity to be used. For transitional ventilation, enough inlet area should be provided to use half of the installed inlet area should be provided to use half of the installed tunnel fan capacity. For best performance, these inlets are automatically controlled by a static pressure sensor (see *Power vent controls* above).

Sidewall curtain controls – A mechanical device designed to open or close sidewall curtains based on desired house temperature.

Slime – A deposit build-up directly related to the excessive growth of microorganisms that secrete or form thick, sticky material. These slimes cause tube pluggage, reduce heat transfer, entrap migratory suspended solids and can result in underdeposit corrosion.

Solubility – The ability of one material (the solute) to dissolve in another (the solvent).

Solutions – Liquid mixtures that are uniform throughout.

Static pressure – A measure of potential energy per unit of volume of air. Static pressure describes the partial vacuum created in a house by exhaust fans, and goes up as the total air inlet area is decreased. It also describes the "resistance" against which the fan must work. Static pressure is usually measured in inches of water. Poultry house ventilation systems are normally designed to operate at static pressures in the 0.04 – 0.10 inch range.

Sump – Lowest portion of the basin to which cold circulating water flows: usually the point of circulating pumps suction connection. Also known as Basin Sump.

Supply Header – Portion of the water supply system, which contains the valves and distribution boxes in a crossflow tower or the lateral pipes in a counterflow tower.

Thermophilic – A Type of bacteria that thrives in very high temperatures.

Tunnel ventilation – A form of negative pressure ventilation in which exhaust fans and large air inlets are at opposite ends of the house, so that ventilation air travels the length of the building at high air velocity (at least 400 feet per minute). The wind-chill effect promotes cooling of birds during hot weather.

Tunnel ventilation inlets – Large openings on the sidewall or end of a house, with total area usually equal to the house cross-sectional area, but greater to accommodate evaporative cooling pads when these are installed. Tunnel inlets are normally fully open during tunnel ventilation, and fully closed by a moveable curtain at all other times.

Unit ventilator – A fan-coil unit package device for applications in which the use of outdoor- and return-air mixing is intended to satisfy tempering requirements and ventilation needs.

Variable air volume system (VAV) – Air handling system that conditions the air to constant temperature and various the outside airflow to ensure thermal comfort.

Ventilation air – Defined as the total air, which is a combination of the air brought inside from outdoors and the air that is being re-circulated within the building. Sometimes, however, used in reference only to the air brought into the system from the outdoors; this document defines this air as "outdoor air ventilation".

Ventilation rate – The rate at which indoor air enters and leaves a building. Expressed in one of two ways: the number of changes of outdoor air per unit of time (air changes per hour, or "ach") or the rate at which a volume of outdoor air enters per unit of time (cubic feet per minute, or "cfm").

Water-formed deposit – Any accumulation of insoluble material derived from water or formed by the reaction of water upon surfaces, including scale, sludge, foulants, sediments, corrosion products or biological deposits.

Wet bulb – The lowest temperature level of the air that can be reached by evaporatively cooling the air.

Wet bulb depression – The difference between the Dry Bulb and Wet Bulb temperatures. I.E. if Dry Bulb is 100 degrees (f) and the Wet Bulb is 70 degrees (f), the Wet Bulb Depression if 30 degrees (f). The Wet Bulb Depression is used to determine the percent of efficiency of the cooling media.

Zone – The occupied space or group of spaces within a building which has its heating or cooling controlled by a single thermostat.

Abbreviations and Letter Symbols

A	approach*
acfm	actual cubic feet per minute*
alt	altitude*
amb	ambient*
amp	ampere
atm	atmosphere
az	azimuth
bar.	barometer
bhp	brake horsepower
Btu	British thermal unit*
CWT	cold water temperature*
cu ft	cubic foot
cu in	cubic inch
cfm	cubic feet per minute (see acfm, scfm)
dB	decibel
F	degree Fahrenheit
diam	diameter
DBT	dry bulb temperature
el	elevation
fbm	feet board measure (board feet)
fpm	feet per minute
fps	feet per second
ft	foot
gpm	gallons per minute (U.S. Liquid measure)
hp	horsepower
HWT	hot water temperature*
hr	hour
in	inch
ID	inside diameter
kw	kilowatt
kwhr	kilowatt hour
lin ft	linear foot
mph	miles per hour
OD	outside diameter
ppm	parts per million

lb	pound
lb per cu ft	pound per cubic foot
lb per hr	pounds per hr*
psia	pounds per square inch absolute
psig	pounds per square inch gage*
R	range (cooling range)*
Rc	recirculation percent*
RH	relative humidity*
rpm	revolutions per minute
sec	second
shp	shaft horsepower
sp gr	specific gravity
sq ft	square foot
std	standard
scfm	standard cubic feet per minute*
temp	temperature
vel	velocity*
WBT	wet bulb temperature*

Letter symbols – for use in equations with appropriate subscripts

(Other units of volume or rate may be indicated):

A	area: sq ft
c	specific heat
d	prefix indicating differential
D	diameter
G	mass air flow; lb dry air per hr per sq ft
g	gravitational acceleration; ft per sec per sec
h	enthalpy of air-water vapor mixture; Btu per lb dry air
K	over-all enthalpy transfer coefficient. Usually expressed as lb per hr per sq ft per lb water per lb dry air.
L	mass water flow; lb per hr per sq ft
L/G	liquid-to-gas ration; lb water per lb dry air
t	air temperature; F
T	water temperature; F
V	effective volume; cu ft per sq ft
v	specific volume; cu ft per lb
W	humidity ratio (specific humidity); grains moisture per lb dry air (or lbs vapor per lb dry air if so indicated)