



Griswold Water Systems: Guidelines Simplified Water Treatment Glossary

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The terms used in water treatment are imprecise and confusing; a situation that can lead to mistakes and poor water treatment results. Below are practical definitions of the terms commonly used and misused. Synonyms are in parentheses.

- **Agglomerate** (flocculate, coagulate): the act of solid particles clumping together to form a larger particle. The larger particles typically lose suspension and settle or float. The synonyms are not quite accurate.
- **Algae**: an opportunistic plant that lives based on photosynthesis, and therefore needs nutrient laden dirt and sunshine to survive.
- **Amoeba**: a common species of protozoa (i.e., an single cell animal) that enters a cooling tower with makeup water and blown-in dust and dirt.
- **Amplification**: the process causing Legionella bacteria living in a biofilm to become infectious and free swimming (i.e., suspended). It occurs when Amoeba eat the biofilm under certain temperature conditions
- **Backwash**: the method of eliminating particles removed by certain types of filters (typically associated with sand filters), by pushing the water backwards through the filter and sending it to a drain in order to prevent clogging of the filter.
- **Biofilm**: the slime layer that forms on cooling system surfaces. It is a communal colony of bacteria with specialized member functions much like a beehive or ant colony. It forms a protective layer on its surface.
- **Bleed**: a continuous intentional discharge of condenser water concentrated with minerals; typically not acceptable for cooling towers.
- **Blowdown**: the periodic intentional discharge of condenser water concentrated with minerals; usually exiting by a conductivity actuated valve.
- **CaCO₃**: the formula for calcium carbonate, which is the most common and potentially harmful dissolved mineral in cooling tower water. When it precipitates it forms either hard lime scale or powder.
- **CFU/mL**: a unit of measurement of the bacteria level reported from a culture test of cooling tower water.

- **Chlorides:** the amount of chloride ions dissolved in water; a common source of chlorides is the dissolving of common salt (sodium chloride).
- **Colloids:** a particular size of suspended particle usually considered less than 1 micron. Milk and paint are colloidal suspensions where the particles never settle.
- **Conditioning Galvanized Steel:** the process of curing the zinc coating on steel to make it non-porous and semi-protective, and avoiding a porous, waxy and destructive zinc compound called White Rust.
- **Conductivity:** the ability of water to conduct electricity; it is only caused by ions (e.g., dissolved minerals) and not caused by suspended solids.
- **Cycles of Concentration:** a measure of the concentration of ions (e.g., dissolved minerals); $\frac{1}{2}$ the water in a system remaining after evaporation equals 2 C of C; $\frac{1}{3}$ the water in a system remaining after evaporation equals 3 C of C.
- **Dissolved minerals** (dissolved solids, ions): substances that were previously solids and have become part of the liquid (i.e., salt dissolved in water).
- **Electroporation:** the breach or damage, due to electric pulses, of a cell membrane causing holes or thin spots; and therefore causing leakage of fluids in and out.
- **Encapsulation:** a pulsed power term meaning that bacteria are captured and encased in mineral precipitation.
- **Float** (lose suspension): the act of a solid particle lighter than water floating.
- **Inverse Solubility** (negative solubility): the characteristic of a particular dissolved mineral such that it precipitates more readily at hotter temperatures rather than cooler ones. Calcium carbonate has this relatively uncommon characteristic, but most dissolved minerals have normal solubility (positive solubility), and precipitate more easily at cooler temperatures (e.g., salt or sugar).
- **Inhibitors:** chemicals added to slow down corrosion, typically by coating the metal with a semi-protective film
- **Nutrient Limitation:** a method of starving a biofilm by reducing the nutrient value (i.e., food) of the water broth that feeds it.
- **Passivate:** changing the electrochemical driving force of corrosion to slow down corrosion. This is typically accomplished by changing the chemistry of the water. Only some metals passivate. The term is used so broadly for achieving different objectives on different metals it is often a cause for confusion.

- **Patina:** a semi-protective corrosion-product film often associated with copper.
- **Powder:** a pulsed power term meaning the result of precipitation (plating-out) of dissolved minerals on the surface of suspended particles.
- **Precipitate** (scale, plate-out): dissolved minerals changing back to a solid.
- **Purge:** a periodic intentional discharge of the solids inventory of a centrifugal separator; usually actuated by a timer.
- **Sacrificial Coating:** the zinc coating of galvanized steel electrochemically protects the steel beneath it by corroding itself, thus zinc corrosion is beneficial
- **Saturation:** the condition of a particular dissolved mineral reaching a concentration level where, at a particular temperature it can not remain dissolved; usually measured in ppm or mg/L.
- **Scale:** the precipitated solid primarily made of calcium carbonate that forms on equipment surfaces when the saturation concentration of dissolved calcium carbonate is exceeded.
- **Seed crystals:** in very concentrated solutions of dissolved minerals, tiny crystals form without the aid of foreign material surface from which to start. This is not applicable in cooling tower water
- **Settle** (lose suspension): the act of a solid particle heavier than water sinking.
- **Sidestream:** a separate recirculation loop with its own pump, typically in and out of a cooling tower basin or remote sump; sidestream implies it is independent from flow in the condenser water loop.
- **Silica:** the term means silicon dioxide (SiO₂), and is essentially sand and makes up most of the content of airborne dust. Silicon's behavior in water is quite complex and can exist as dissolved silicon and suspended particles of silica.
- **Slipstream:** a water stream with its own pump branching off from the condenser water loop, typically in and out of a pipe; slipstream implies dependence on flow in the condenser water loop. A captive slipstream pump is the only acceptable method of insuring proper flow in the slipstream.
- **Specific gravity:** a material characteristic that is a measure of density (i.e., weight per unit volume). It is unit-less measure of density by comparing its density with the density of water.
- **Supersaturation:** the condition of having more of any particular dissolved solid, stay dissolved than the saturation concentration should permit; this is a temporary

condition that eventually falls back to saturation over time, through the process of precipitation.

- **Surface Charge:** the static electricity charge that forms on the surface of suspended particles in water. The charge can be removed from the particle into the water without any sort of grounding when it passes through the Wave.
- **Surface nucleation:** the act of dissolved minerals precipitating with the aid of a solid surface from which to start and grow (i.e., the solid surface could be an equipment surface or a suspended particle).
- **Suspended solids** (colloids are tiny versions of these): particles of solid material that are too small to sink or float, and stay hovering in the water.
- **Tranquil Basin:** flow conditions where the water in a cooling tower basin is not turbulent; gently flowing water is often said to have lamellar flow.