# Water Treatment Chemicals Discharged In Cooling Tower Blowdown & Drift

**Table 1 - Green & Non-Green Biocides**

| Green Biocides | Non-Green Biocides – Organic* or Halogen**<br>* 70-80 million pounds per year of non-oxidizing biocides used in US<br>** source of AOX, or adsorbable organic halogen |
|---|---|
| Ozone | N-Alkyl (C12, C14,C16) dimethyl benzyl ammonium chloride |
| Hydrogen Peroxide | 5-chloro-2-methyl 4-isothiazolin-3-one |
| Tetrakis(hydroxymethyl) phosphonium sulfate (THPS) | 2,2-dibromo-3-nitrilopropionamide (DBNPA) |
| | Gluteraldehyde |
| | Chlorine *(** source of AOX)* |
| | Bromine *(** source of AOX)* |
| | 1-bromo-3-chloro-5,5-dimethylhydantoin *(** source of AOX)* |
| | Chlorinated isocyanurates *(** source of AOX)* |
| | Chlorine Dioxide (gas) |

**Table 2 - Green & Traditional Dispersants**

| Green Dispersants | Traditional Dispersants - Organic |
|---|---|
| Polyaspartic Acid | Polyacrylic Acid (PAA) |
| | Polymethacrylic Acid (PMAA) |
| | Polyacrylamide (PAm) |
| | Polymaleic Acid (PMA) |
| | AA/Am copolymers |
| | AA/MA copolymers |
| | AA/2-acrylamido-methylpropane sulfonic acid copolymers (AA/AMPS copolymers) |
| | AA/sulfonic acid/ sodium styrene sulfonate terpolymers (AA/SA/SSS terpolymers) |
| | MAA/AMPS copolymers |

**Table 3 - Green & Traditional Steel Corrosion Inhibitors**

| Green Corrosion Inhibitors | Traditional Corrosion Inhibitors - Organic / Phosphate / Metal |
|---|---|
| sodium silicate (polysilicate) | Hydoxy-2-phosphono acetic acid (HPA) |
| | Phosphate esters of alcohols and ethanolamines |
| | Sodium Benzoate |
| | Potassium pyrophosphate, Trisodium phosphate, and Sodium hexametaphosphate |
| | Sodium molybdate |
| | Zinc sulfate or chloride |
| | Zinc pyrophosphate |

**Table 4 - Green & Traditional Copper Corrosion Inhibitors**

| Green Corrosion Inhibitors For Copper | Traditional Corrosion Inhibitors For Copper - Organic |
|---|---|
| sodium silicate (polysilicate) | Benzotriazole |
| | Sodium tolyltriazole |
| | Sodium mercaptobenzothiazole |

**Table 5 - Green & Traditional Scale Inhibitors**

| Green Scale Inhibitors | Traditional Scale Inhibitors - Organic / Phosphate |
|---|---|
| Polyaspartic Acid | Aminotri(methylenephosphonic acid) or AMP for Calcium scales |
| | 1-Hydroxyethylidine-1,1-diphosphonic acid or HEDP for Calcium scales |
| | 2-phosphonobutane-1,2,4-tricarboxylic acid or PBTC for Calcium scales |
| | Hexamethylenediaminetetra (methylenephosphonic acid) or HMDT(MPA) for Ca sulfate |
| | Diethylenetriaminepenta (methylenephosphonic acid) or DETP(MPA) for Ba sulfate |