



Clorious²

High purity, ready-to-use chlorine dioxide

Biofilm removal and microbial control in cooling water and systems

BACKGROUND AND CHALLENGE

Due to high temperatures and permanent scrubbing of nutrients, cooling towers and evaporative condensers shape a perfect environment in which microorganisms can thrive. Controlling and preventing the growth of microorganisms in a cooling tower system is extremely important for health reasons and required to keep the tower running under optimal operating conditions.

Microorganisms may cause serious problems in the system through which the cooling water circulates:

- Build-up of odour episodes and slimes. Slime formation requires frequent mechanical cleaning of the fills.
- Loss of heat transfer due to the low thermal conductivity of the biofilm and inorganic deposits which further impede the heat exchange.
- Increased corrosion rates due to acidic by-products secreted by anaerobic bacteria present in the biofilm and blocking of contact of corrosion inhibitors with the metal by the biofilm layer.
- Increased pumping energy required to circulate the cooling water in the presence of biofilm which has a high friction factor.
- Formation of mineral scale. All scaling begins at a site where nucleation can occur. Biofilm may provide a site, and its existence can contribute to scaling problems.
- Unacceptable health risks, such as the formation of Legionella species, which in turn may lead to an outbreak of Legionnaires' disease, a possibly fatal form of pneumonia.

The costs of remedial action to correct these problems, maintenance costs and downtime (lost production) must be added.

CONVENTIONAL TREATMENT METHODS

- The most commonly used chemicals in a cooling water treatment program are corrosion inhibitors, antiscalants, and biocides, addressing the need in the water circuit for corrosion, scale and microbial control respectively. Based on their inactivation mechanism, biocides can be categorised in two main groups: oxidising and non-oxidising biocides.
- Oxidising biocides typically used to treat cooling water are chlorine or bromine based compounds. These halogens are highly reactive with other chemicals and organics present in the water. Once these reactions take place, these biocides lose much of their ability to eliminate the microorganisms present. Instead, unwanted halogenated organic compounds (AOX) may be formed. Since their biocidal efficacy decreases with increasing pH, the application may be limited in cooling towers that operate in the alkaline pH range for corrosion control.
- Non-oxidising biocides like CMIT/MIT compounds or DBNPA are also employed. These biocides are typically slow acting and are slug-fed, i.e. added periodically to achieve high concentration, then allowed to decrease until the next addition. With this type of treatment the biocide is dosed to maintain a residual for an appropriate contact time to achieve an effective kill. Repetitive treatments allow those strains of bacteria which are fairly resistant to the biocides to predominate in a system which requires frequent rotation of the treatment program.

BENEFITS OF CLORIOUS2

- Innovative, one-step biocide concept cooling for water treatment.
- Removes the insulating biofilm from the heat exchange surfaces allowing the cooling tower system to operate at maximum efficiency.
- High purity and water solubility enable a robust yet gentle sanitation of all parts and components of the cooling water circuit.
- Fast acting, selective oxidation chemistry means lower dosage rates in contaminated systems compared to conventional biocides.
- Suitable for conditions unfavourable to halogens; non-reactive with ammonia and does not chlorinate organics, so no AOX formation in blowdown and effluent water.
- Exhibits broad spectrum antimicrobial efficacy over a wide pH range (2 – 10), so suitable for cooling towers that operate near pH 8 for corrosion control. No chemicals are required for pH adjustment.
- Capable of removing blue-green algae. Best available technology for Legionella prevention and control.
- Simple, plug-and-play application with high dosing accuracy.
- Safety first: a closed dispensing system ensures dry (de) coupling with no exposure to the chemical for operators.

APPLICATION METHOD

- Clorius2 is dosed in the appropriate parts and systems of the cooling water circuit with standard dosing equipment suitable for chlorine dioxide. This enables a thorough sanitation of the entire cooling water system in one step.
- Depending on the application and its requirements, Clorius2 may be dosed either continuously or intermittently. Both schemes are based on establishing a chlorine dioxide residual in the system with a certain contact time. For

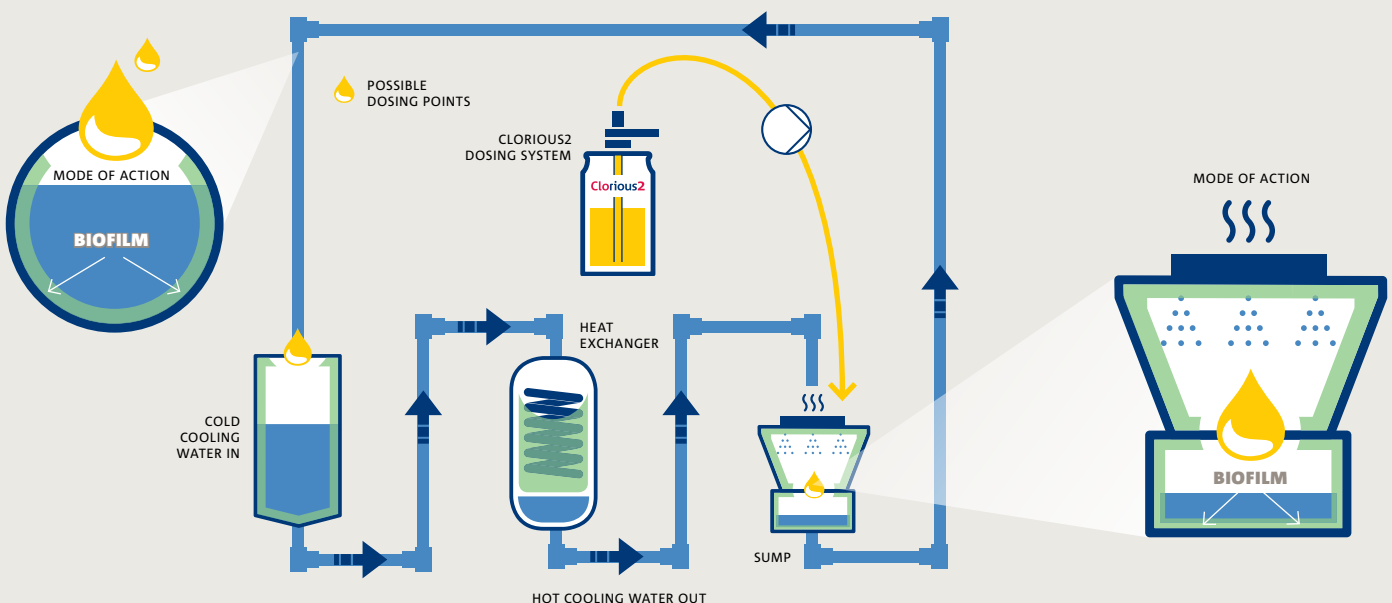
more information about application method and feed rates, please consult the Technical Data Sheet.

- For removal of biofilm or algae, higher dosages may be shock-dosed depending on material compatibility and the degree of microbiological contamination. The system shall be mechanically cleaned prior to such a treatment.
- Residual chlorine dioxide concentrations in the system can be monitored with specific, substantiated methods like the DPD- Glycine method, Palintest or online using chlorine dioxide electrodes.
- Regular treatment of the cooling water with Clorius2 prevents recurrence of biofilm and recontamination securing permanent microbial control throughout the entire system.

RESULTS

- With Clorius2 operators are able to meet industry standards or regulatory provisions applicable to the hygienically sound operation of cooling towers.
- Enhanced process hygiene means better water quality and lasting improvements in the efficiency of the cooling system as a whole.
- Simple, effective and permanent removal of biofilm and persistent microbial control in cooling water and systems.
- Biofilm control means decreased microbiologically induced corrosion throughout the system which results in an improvement in the operating condition of the plant and lifespan of the cooling tower.
- Longer intervals between mechanical cleaning.
- Improved heat transfer.
- Increased process stability means less downtime and lost production which saves money.

CLORIOUS2 DOSING AND MODE OF ACTION IN COOLING WATER CIRCUIT



Brenntag Holding GmbH
 Messeallee 11, 45131 Essen
 Germany
 clorius2@brenntag.de

www.clorius2.com

CLORIOUS2: USING CHLORINE DIOXIDE HAS NEVER BEEN SO SAFE AND SIMPLE

Cooling water treatment

/ in one step / with one single product
 / throughout the entire system