COOLING TOWER AND BOILERS

APPLICATIONS AND TREATMENT PROCEDURES



A correct diagnosis of the system starts from its classification:

1. CLASSIFICATION BY USE:



HVAC Heating, Ventilation and Air Conditioning)

Primarily used in air-conditioning systems They play a crucial role in maintaining comfortable indoor temperatures in residential, commercial and institutional buildings.



Industrial Cooling Towers

Designed to remove heat from industrial processes and equipment. They are used in power plants, manufacturing plants, chemical plants and refineries.

2. CLASSIFICATION BY BUILD:



Package Type

Factory-preassembled for easy transport and installation, these compact towers suit moderate cooling needs with lower capacity than field-erected units. They are used in food, textile, chemical plants, hospitals, hotels, malls and factories



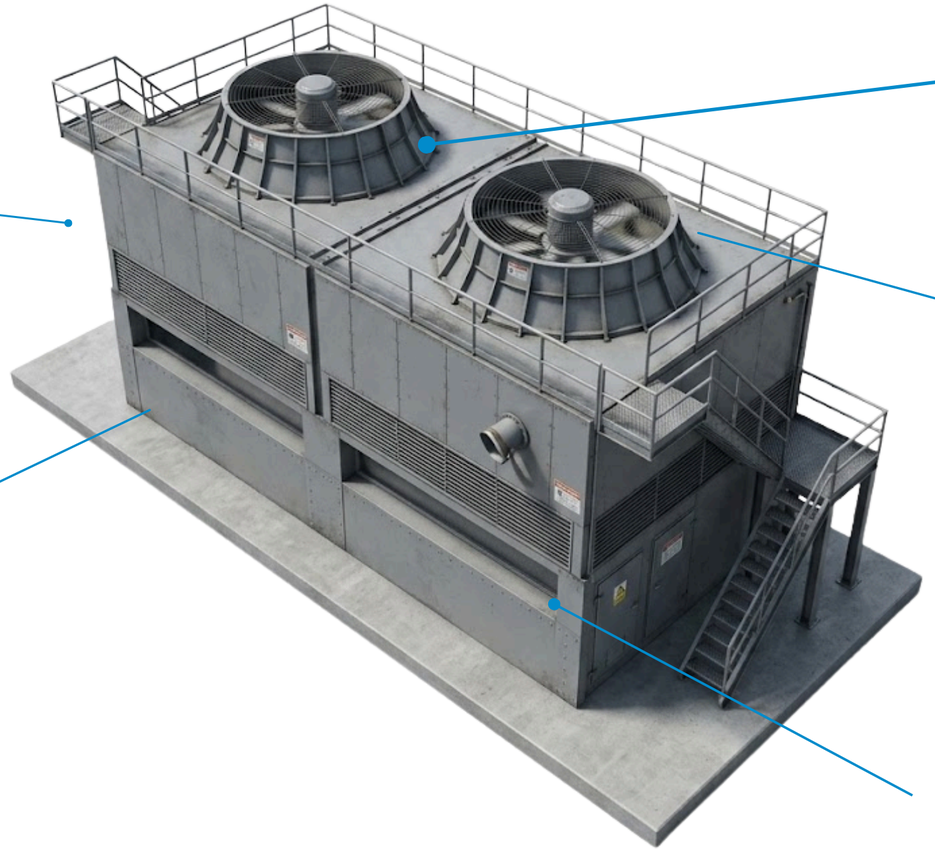
Field-Erected Type

Field-erected cooling towers are built on-site for scalability and high heat loads, commonly used in power plants, steel, petroleum and petrochemical industries to efficiently manage industrial process heat.

COOLING TOWER OPERATION

Heat absorption

Water circulates through coolers and condensers, absorbing heat and returning warmed to the tower



Return to cooling tower

The now warm water is returned to the top of the cooling tower

Heat dissipation

Warm water trickles over fill inside the tower, increasing surface area for maximum air contact

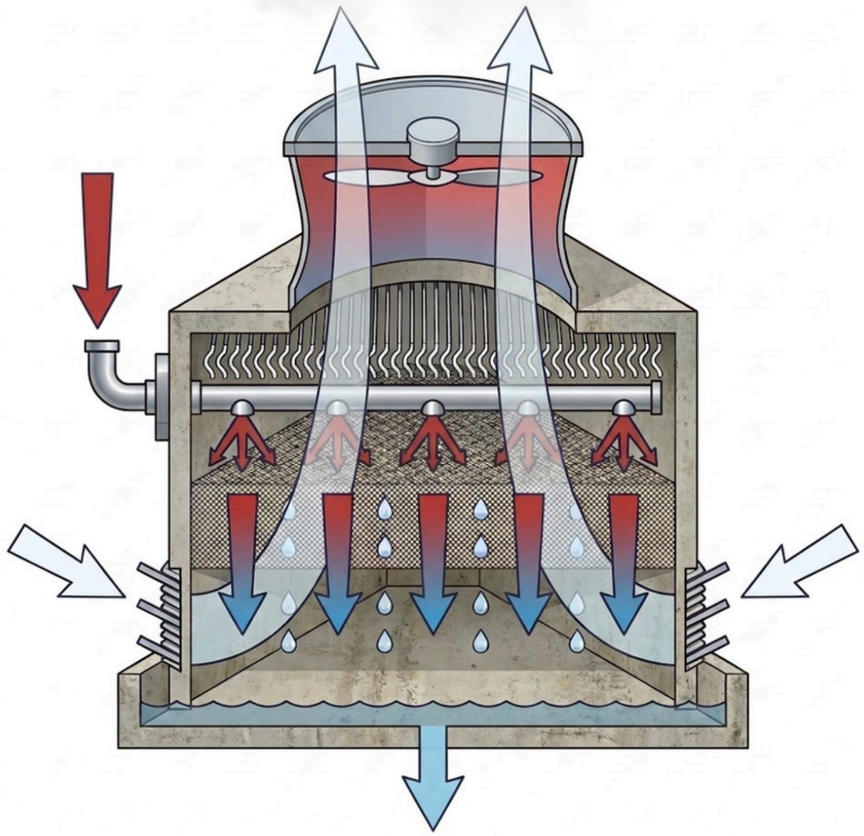
Air and water interaction

Ambient air enters the tower naturally or via fans, flowing upward to meet the descending water

Cycle repeats

Cooled water returns to the facility to absorb more heat, continuing the cycle

COUNTER-FLOW COOLING TOWER OPERATION



Counter-flow cooling towers are designed to maximize heat exchange, offering high performance in a small footprint.

During operation, however, evaporation leads to the concentration of impurities present in the water, promoting the formation of scale, corrosive phenomena and biofilm development.

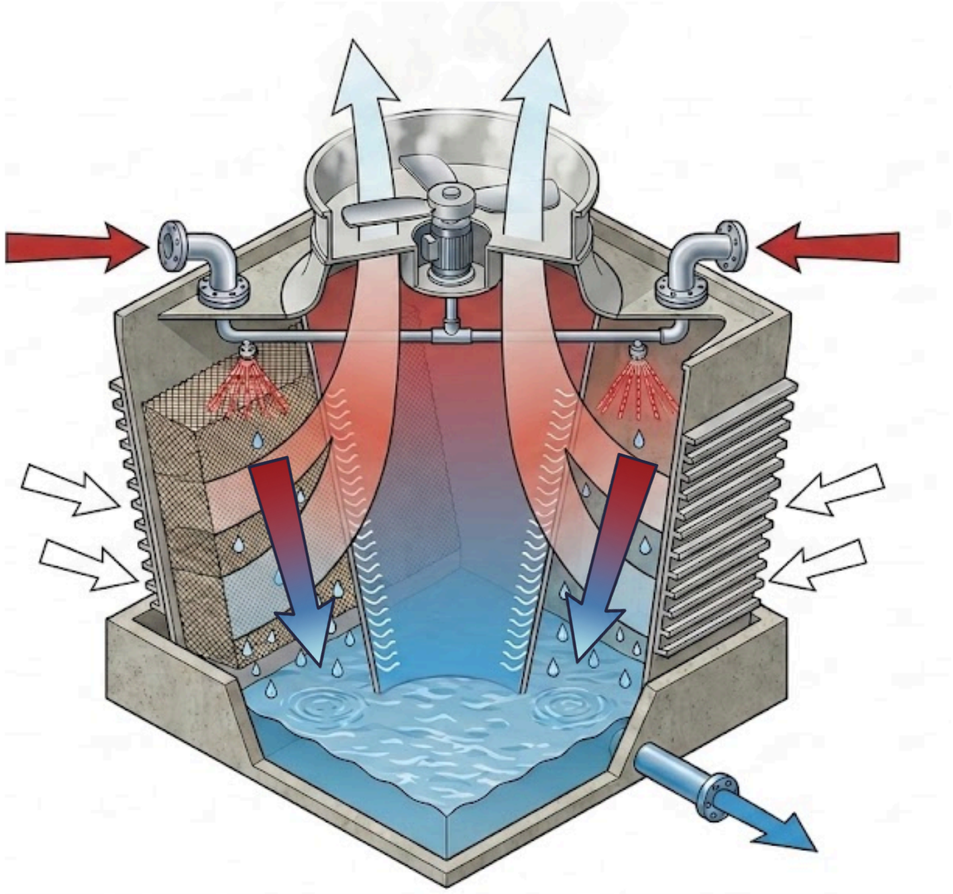
To manage these critical issues, Injecta offers effective treatment **solutions**:

- Automated dosing of inhibitors and biocides to ensure continuous protection
- Real-time monitoring of key parameters such as pH, conductivity and ORP

These systems allow to:

- Maintain stable water conditions and cooling efficiency
- Reduce maintenance interventions, downtime and chemical consumption
- Prolong the life of the equipment, ensuring safe and reliable operation over time

CROSSFLOW COOLING TOWER OPERATION



Crossflow cooling towers use horizontal airflow to ensure effective heat dissipation, making them particularly suitable for HVAC applications and commercial contexts.

However, this configuration presents some critical issues. The perpendicular airflow, along with the accumulation of debris on inlets and fans, can reduce system efficiency and increase the risk of scale and localized corrosion.

From a water treatment perspective, uneven distribution, the presence of stagnant zones and the accumulation of impurities can promote the formation of scale, microbiological growth and a decrease in heat exchange capacity.

To manage these critical issues, Injecta offers effective treatment **solutions**:

- Automated dosing systems and real-time monitoring to ensure continuous protection
- Optimized chemical usage, preventing over- or under-dosing and protecting critical components like fans, fill and basins

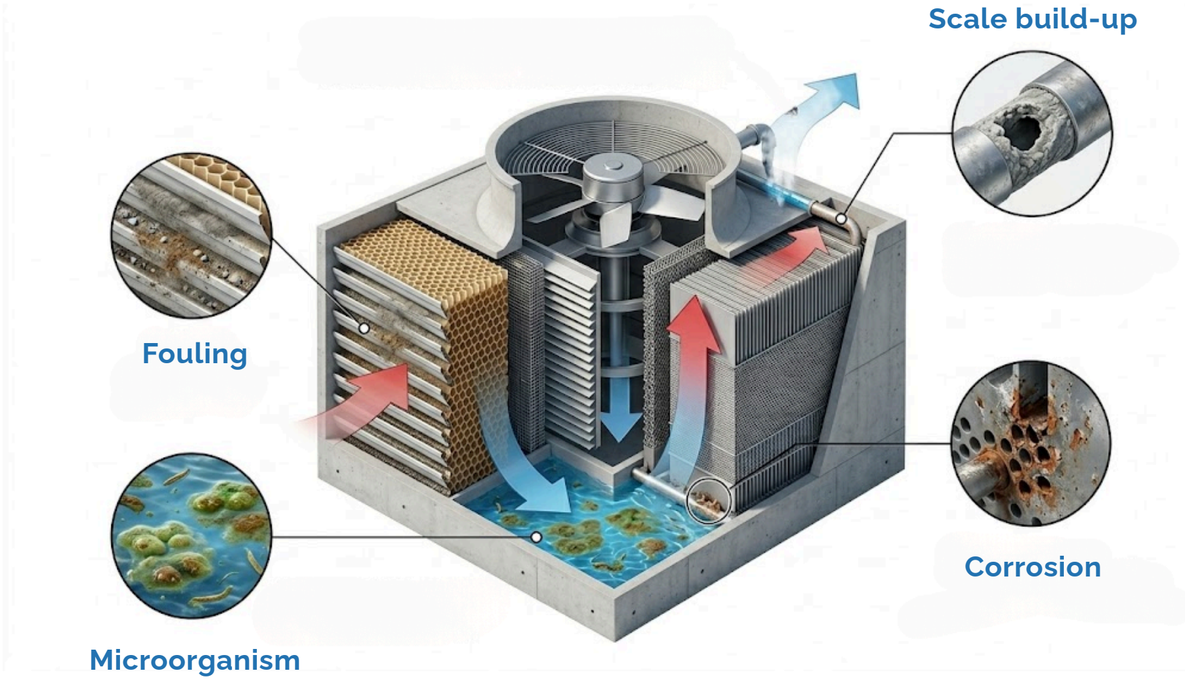
These systems allow to:

- Achieve uniform cooling and greater operational efficiency
- Prevent scale and corrosion
- Reduce maintenance, downtime and energy consumption
- Extend equipment life and ensure reliable operation over time

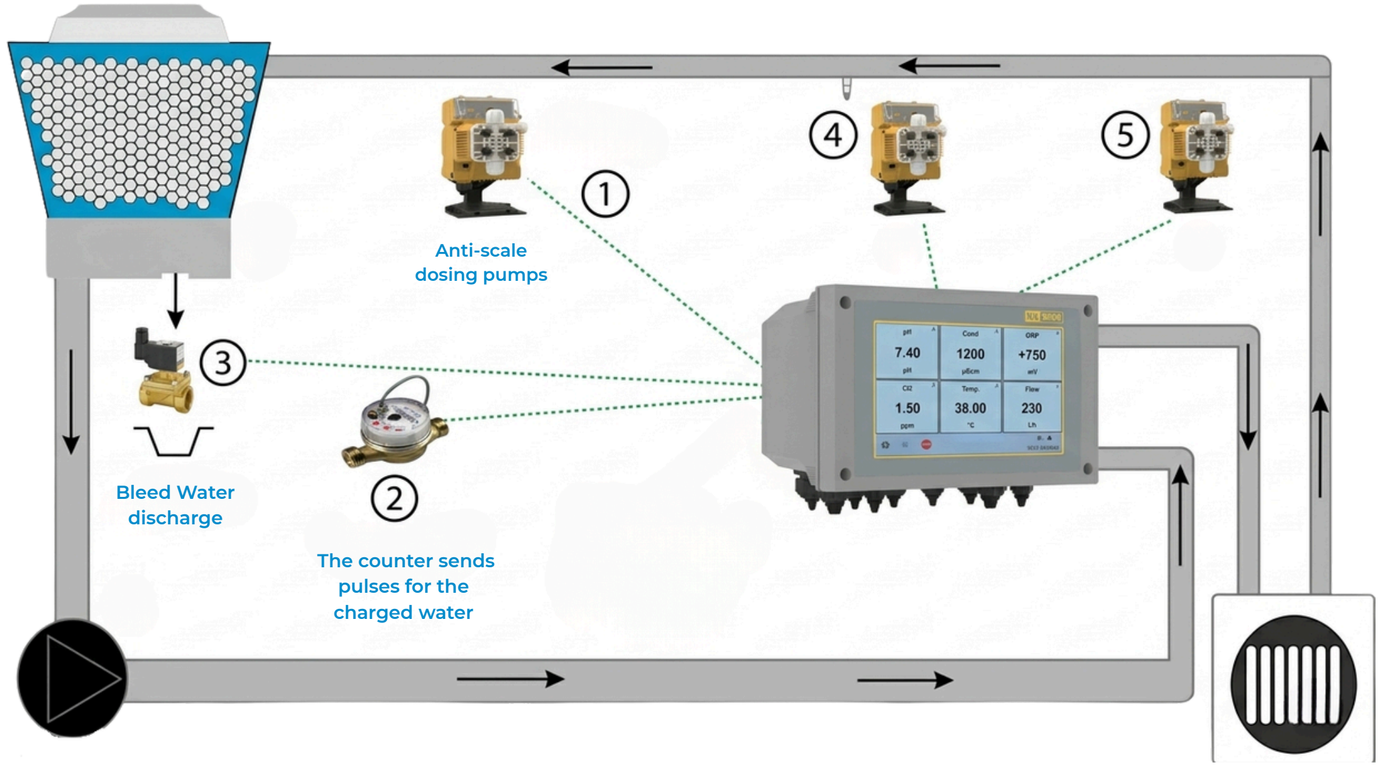
CHEMICAL-BIOLOGICAL ISSUES AND RISK ANALYSIS

The water within these circuits is subjected to continuous physical and thermal stress. Because water is continually lost through evaporation, the concentration of impurities in the system constantly increases.
The main issues are:

- **Scale**: Due to the separation of calcium salts present in the water, resulting in deposits on system surfaces.
- **Corrosion**: Due to the action of dissolved oxygen and exacerbated by the concentration effects generated by scaling substances
- **Microorganism Growth:** Strongly favored by high water temperature. Microbial growth in towers can cause corrosion, fouling and increased energy usage
- **Fouling**: Airborne dust and dirt can accumulate inside, reducing heat transfer efficiency



TREATMENT PROCESSES



Water treatment in evaporative towers is based on **two** main aspects:

1. Chemical control (anti-scale):

An anti-scale product is dosed proportionally to the incoming water.
As some water evaporates, salts concentrate: a conductivity meter detects the conductivity and, if it exceeds the limit, triggers the bleed and the addition of clean water to dilute.

2. Microbiological control:

A biocide is dosed to prevent algae and bacteria, using a dosing pump with an integrated timer or control systems that monitor parameters like ORP or residual chlorine.
Continuous monitoring of pH, conductivity and ORP allows for optimal system management.


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the perfect dosing