



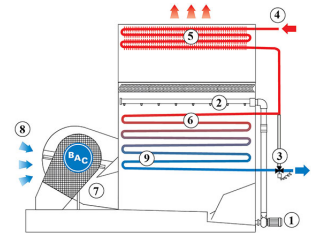
# Principle of operation

## Closed circuit cooling towers

### Principle of operation

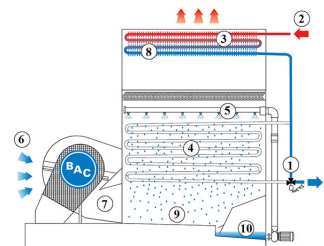
#### Dry operation

The spray water **pump (1)** and **spray system (2)** are turned off and the modulating **flow control valve (3-way valve) (3)** remains fully open. The warm process **fluid (4)** flows both through the **finned discharge coil (5)** and the **prime surface coil (6)**. A **fan (7)** blows the ambient **air (8)** over the coil and cools the **fluid (9)** inside the coil. In this mode neither water consumption nor plume occurs.



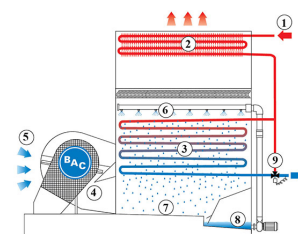
#### Adiabatic operation

The **flow control valve (3-way valve) (1)** lets the warm process **fluid (2)** flow through the **finned discharge coil (3)**, by-passing the **wet prime surface coil (4)**. The prime surface coil is wetted by the **spray water (5)** but there is no water evaporation for heat rejection purposes. Some water will however evaporate, which will humidify the incoming ambient **air (6)** that is blown by a **fan (7)** over the coils. This saturated air has a better cooling capacity to cool down the process **fluid (8)** in the finned coil. The spray water drops into a plenum with sloping **bottom (9)** and drains into the separated wet **sump (10)**. The pump recirculates the water to the spray system. Visible plume and water consumption are greatly reduced while the design fluid outlet temperature is kept.



## Wet-dry operation

The warm process **fluid (1)** flows both through the **finned discharge coil (2)** and the **prime surface coil (3)**. A **fan (4)** blows the **air (5)** over the coils. At the top where the warm fluid enters the tower, the discharge air is saturated and pre-cools already the fluid. Then a next heat transfer process occurs in the prime surface coil which is wetted by the **spray system (6)**. The spray water drops into a plenum with **sloping bottom (7)** and drains into the separated wet **sump (8)**. The pump recirculates the water to the spray system. When there is less heat load or the ambient temperature drops, the **modulating valve (9)** will control the flow through the prime surface coil in a way that the design fluid outlet temperature is kept. Plume is also minimized because there is less evaporated water and the discharge air is heated with the dry finned coil.



**You want to use the HFL hybrid closed cooling tower to cool your process fluid?** Contact your local [BAC representative](#) for more information.