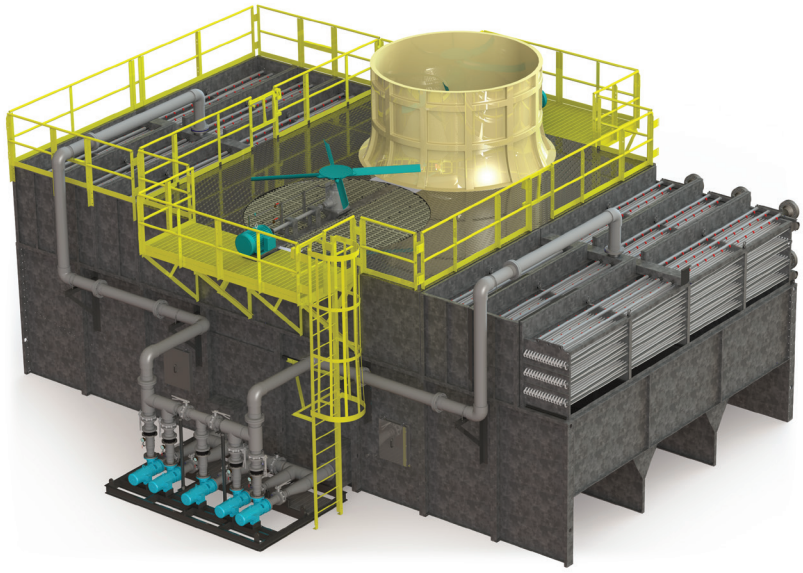
Cool or condense more efficiently using closed-loop systems

Niagara Wet Surface Air Coolers (WSAC®) application study



Are WSAC® closed-loop, evaporative coolers a solution for your heat transfer process applications?

Fluid cooling and vapor/gas condensing can be accomplished by several methods. The most common methods are an open tower with plate-and-frame or shell-and-tube heat exchangers (wet), or air-cooled, fin-fan coolers (dry). In an open tower configuration, there are two loop systems—one open and one closed—requiring two heat transfer devices to complete the same duty. Open-loop water flows through a heat exchanger, where it is warmed, then flows to the cooling tower, where it is cooled via evaporation. This means there are two approach temperatures, a sensible approach in the heat exchanger and a second (latent) approach to the wet bulb in the cooling tower.

The Wet Surface Air Cooler, an alternate more efficient technology is used successfully for auxiliary fluid cooling and vapor condensing. As its basic principle of operation, heat is rejected by means of latent (evaporative) heat transfer. The fluid/vapor that needs to be cooled or condensed flows through tube bundles as part of a closed-loop system. Water from the unit basin is sprayed in large quantities over the tube bundle's exterior surface. Air is induced by fans, and latent heat transfer through evaporation takes place at the fluid film on the tubes. The saturated air stream makes two 90° turns in the unit's plenum at a lower velocity, dropping almost all of the large water droplets back into the basin. The air then is discharged out of the unit through fan stacks.

The exterior of the tube surface remains wet during operation because of the large quantity of water sprayed over the tube bundle. The air and water flow over the exterior surface of the tube bundles in the same direction (co-current flow), preventing dry areas on the underside of the tubes. The mixed water temperature remains above freezing because the air passes over the spray system water before and during contact with the tube bundle. This protects the unit from freezing even when the ambient air temperature is below freezing.

What is a WSAC?

Alfa Laval Niagara Wet Surface Air Coolers (WSAC®) are efficient closed-loop, evaporative cooling systems designed for the power, process, wastewater, natural gas and petrochemical industries.

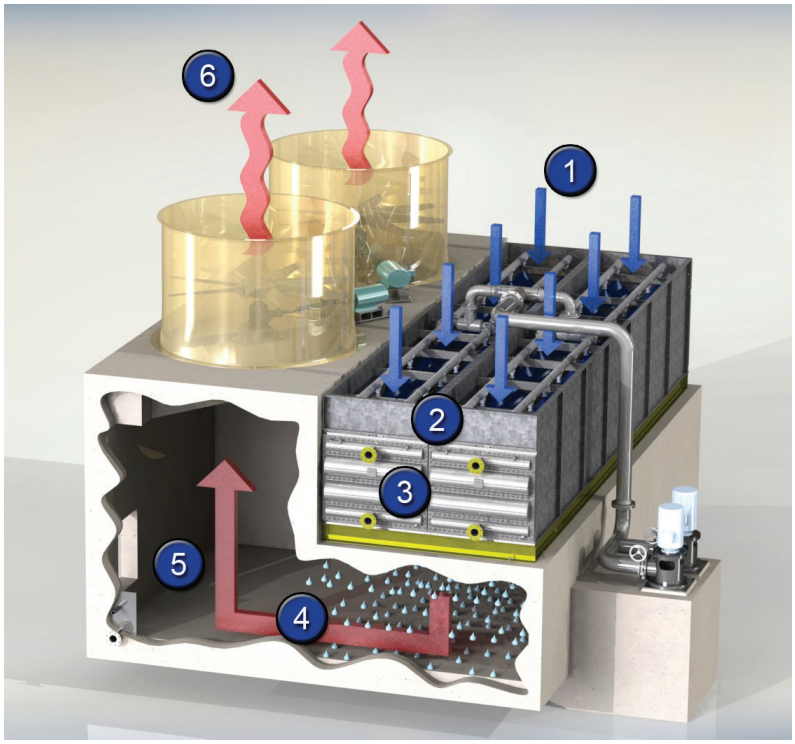
These fluid cooling and vapor condensing systems are optimized for industrial applications where rugged designs, and cost-effective, efficient closed-loop cooling and condensing duties are required.

NIAGARA
Wet Surface Air Coolers

Niagara WSAC® - How it works

The closed-loop design ensures that the process liquid, vapor or gas flows through the inside of the heat exchanger tubes, with the cooling air and the spray water flow in the same direction on the outside of the tubes.

1. Air is induced downward over tube bundles
2. Water flows downward along with the air
3. Heat from the process stream is released to the cascading water
4. Vaporization transfers heat from cascading water to the air stream
5. The air stream is forced to turn 180° providing maximum free water removal
6. Fans discharge air vertically at a high velocity to minimize recirculation



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