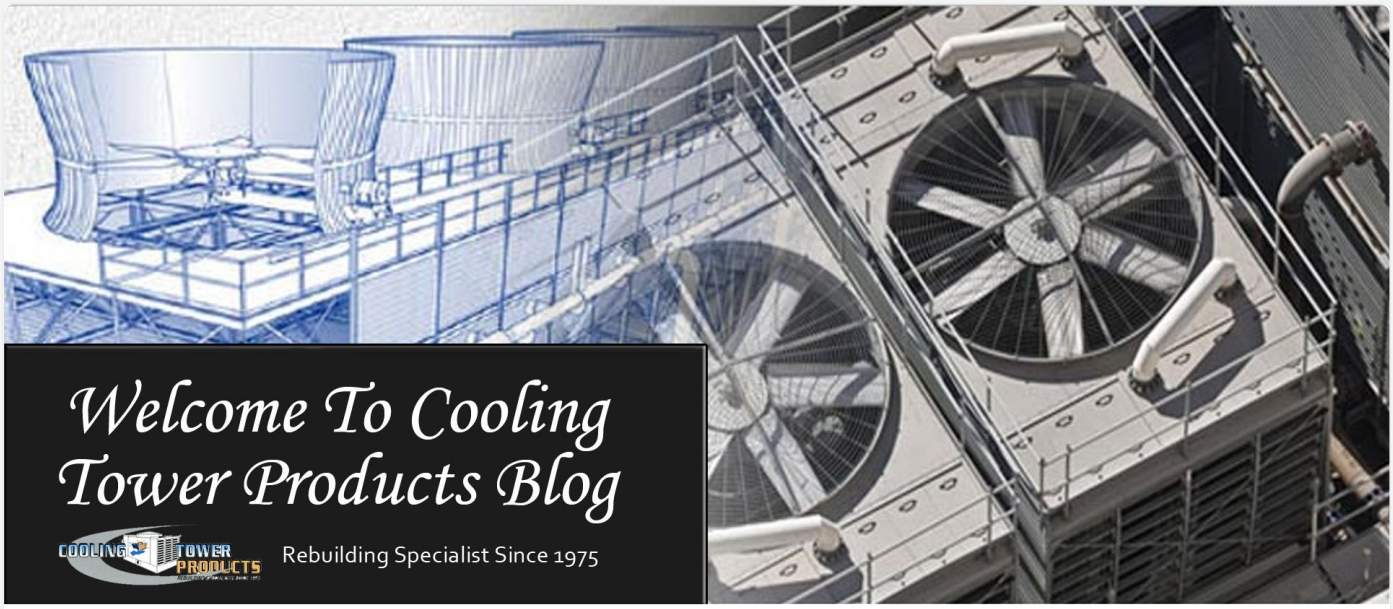
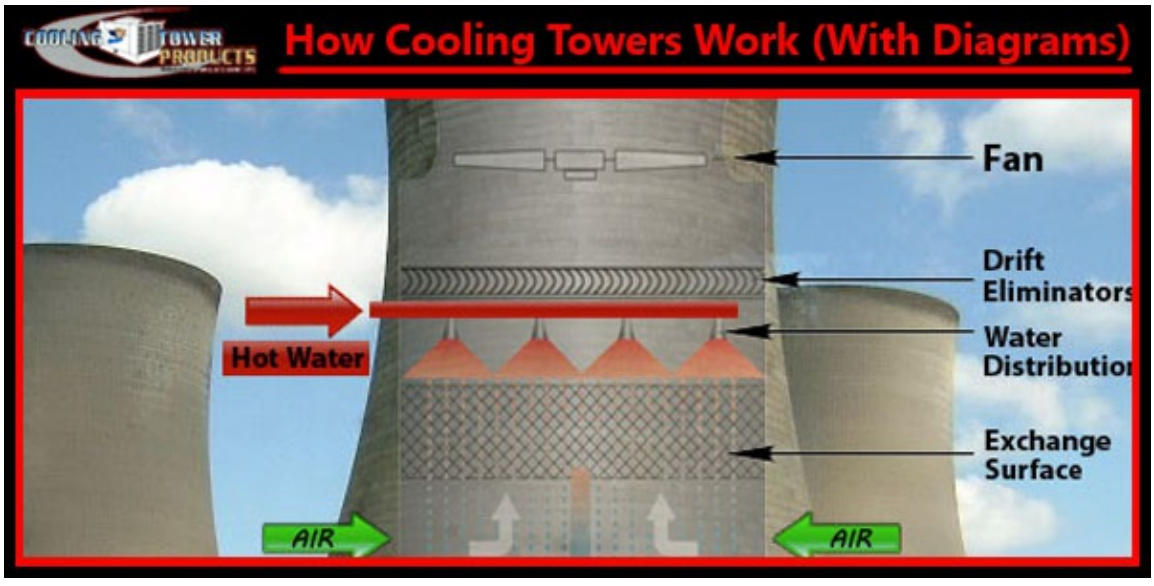


28. Sep, 2016

How Cooling Towers Work (With Diagrams)

Ever wondered how cooling towers work? Here we explain in full detail how cooling towers operate with example text, pictures, diagrams and principles.



See the more detailed explanation of Cooling Towers systems,

diagrams & pictures below

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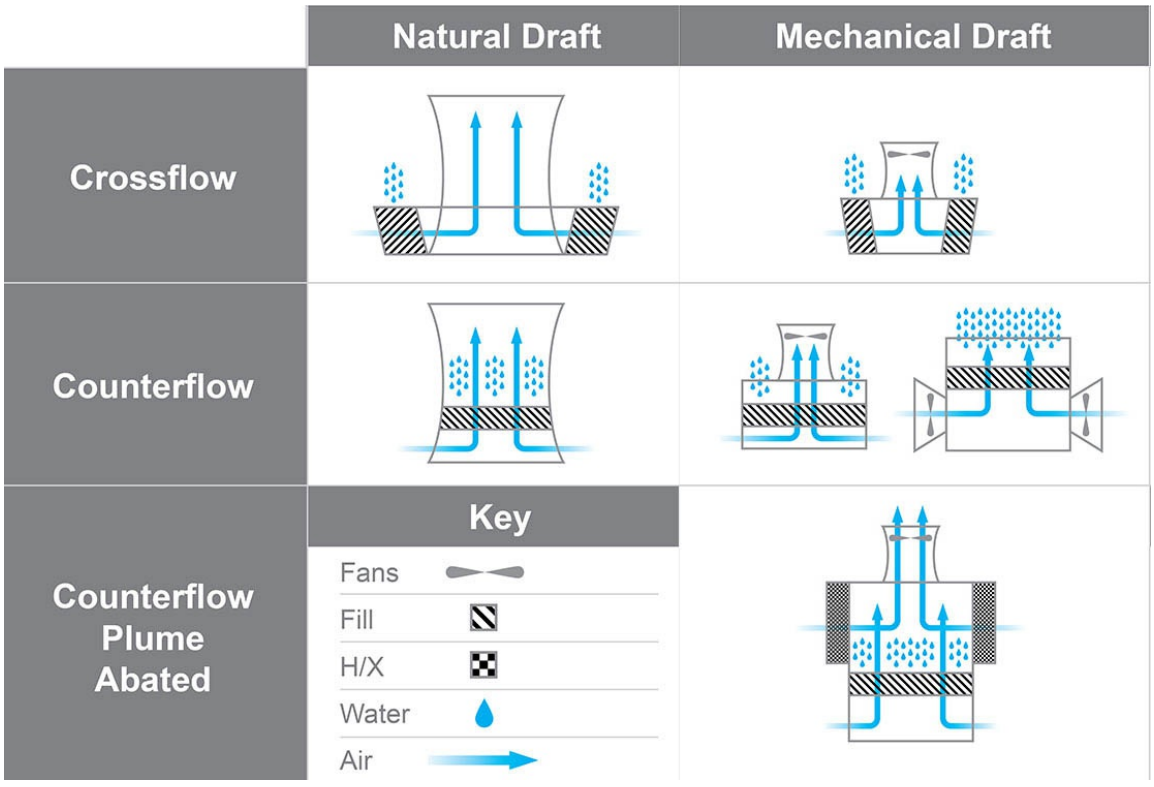
What Is A Cooling Tower? Answered



What is a cooling tower? Cooling towers are a special type of heat exchanger that allows water and air to come in contact with each other to lower the temperature of the hot water. During the cooling tower working process, small volumes of water evaporate, lowering the temperature of the water that's being circulated throughout the cooling tower.

In a short summary, the **purpose of a cooling tower** is to cool down water that gets heated up by industrial equipment and processes. Water comes in the cooling tower hot (from industrial process) and goes out of the cooling tower cold (back into the industrial

process). Here we discover **cooling tower functions** and inner working of cooling towers for different applications.

How Do Cooling Towers Work Explanation

What are cooling towers? Cooling towers are a special type of heat exchanger that allows water and air to come in contact with each other to lower the temperature of the hot water. During this process, small volumes of water evaporate, lowering the temperature of the water that's being circulated throughout the cooling tower. In a short summary, a cooling tower cools down water that gets over heated by industrial equipment and processes.

The hot water is usually caused by air conditioning condensers or other industrial processes. That water is pumped through pipes directly into the cooling tower. Cooling tower nozzles are used to spray the water onto to the "fill media", which slows the water flow down and exposes the maximum amount of water surface area possible for the best air-water contact. The water is exposed to air as it flows throughout the cooling tower. The air is being pulled by an motor-driven electric "cooling tower fan".

When the air and water come together, a small volume of water evaporates, creating an action of cooling. The colder water gets pumped back to the process/equipment that absorbs heat or the condenser. It repeats the loop over and over again to constantly cool down the heated equipment or condensers. For more knowledge and learning about cooling towers visit Cooling Tower Fundamentals by SPXCooling.

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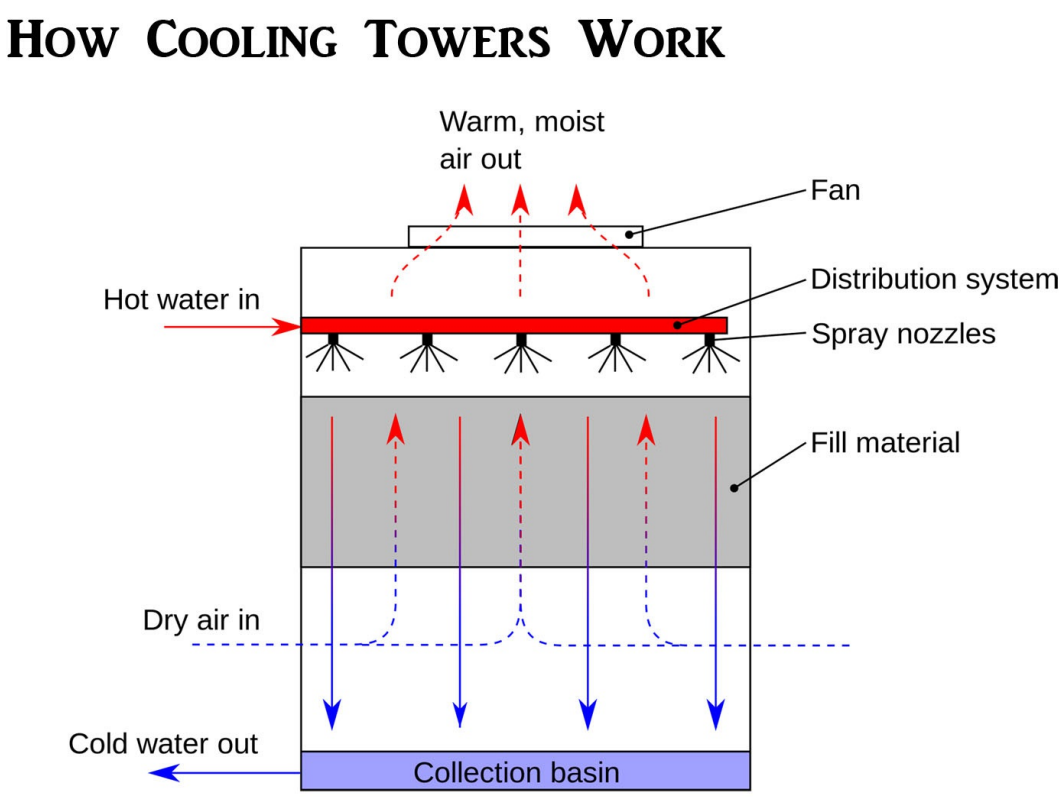
Cooling Tower Working Priciple



There are many different types of cooling towers but the **cooling tower working priciples** stay pretty much the same. Most cooling towers work based on the principle of "*evaporative*

cooling".

What is Evaporative Cooling? Evaporative cooling is the process where warm water from an industrial process is pumped up to the top of the cooling tower where the water distribution system is. The water then gets distributed by cooling tower nozzles to the wet deck. At the same time, air is being drawn through the air-inlet louvers forcing water to evaporate. Evaporation causes the heat to be removed from the make up water. The hot air naturally rises out of the tire.

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What are cooling towers used for?

An **HVAC cooling tower** is used for disposing or rejecting heat from chillers. Air cooled chillers are less effecient than water cooled chillers due to rejection of heat from tower water near wet-bulb temperatures.

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Cooling Tower Applications

Tradional HVAC heating and cooling systems are used in schools, large office buildings, and hospital. On the other hand, Cooling towers are much larger than tradional HVAC systems and are used to remove heat from cooling tower water systems in petroleum refineries, plants, natural gas processing plants, petrochemical plants, and other industrial processes and facilites.

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Types Of Cooling Tower Systems

Cooling towers are usually designed for specific purposes. Not all cooling towers work for all applications or industrial processes. Here we help you understand the various types of cooling towers, there advantages/disadvantages and determine which cooling tower type is right for your industrial process. Check out the cooling tower list and parts list that provides an overview of cooling tower types to help you figure out which tower is right for your industrial application and what replacement parts you might need.

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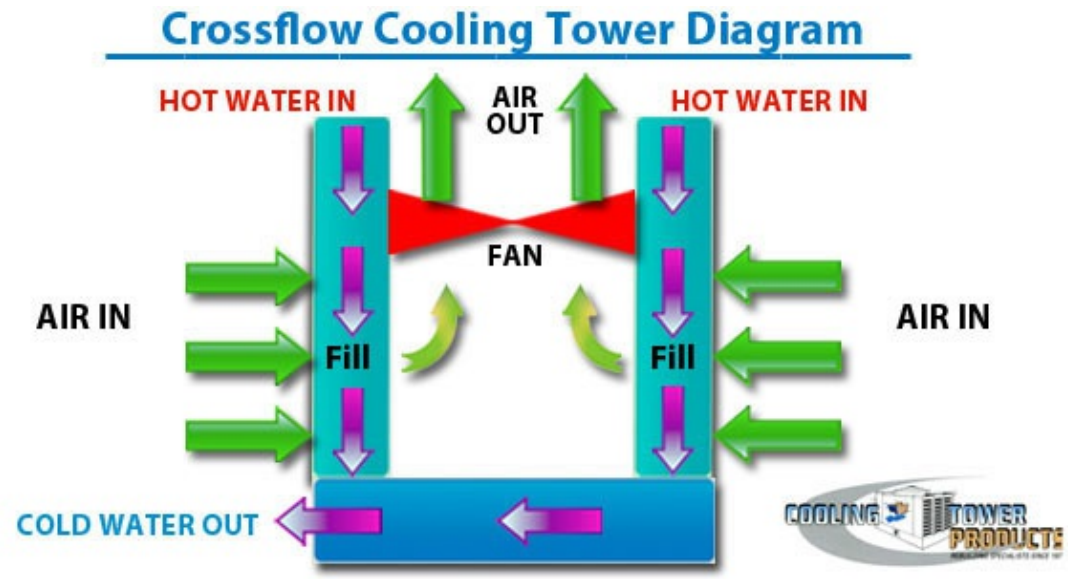
Crossflow Cooling Towers Flow Diagram

In crossflow cooling tower systems the water vertically flows through the fill media while the air horizontally flows across the falling water. That's why they call it "crossflow" because the air and water cross paths or flows. Because of the crossing of flows, the air doesn't need to pass through the distribution system. This permits the use of hot water flow via gravity and distribution basins on the top of the tower right above the fill media. The basins are a standard of crossflow cooling towers and are applied on all units.



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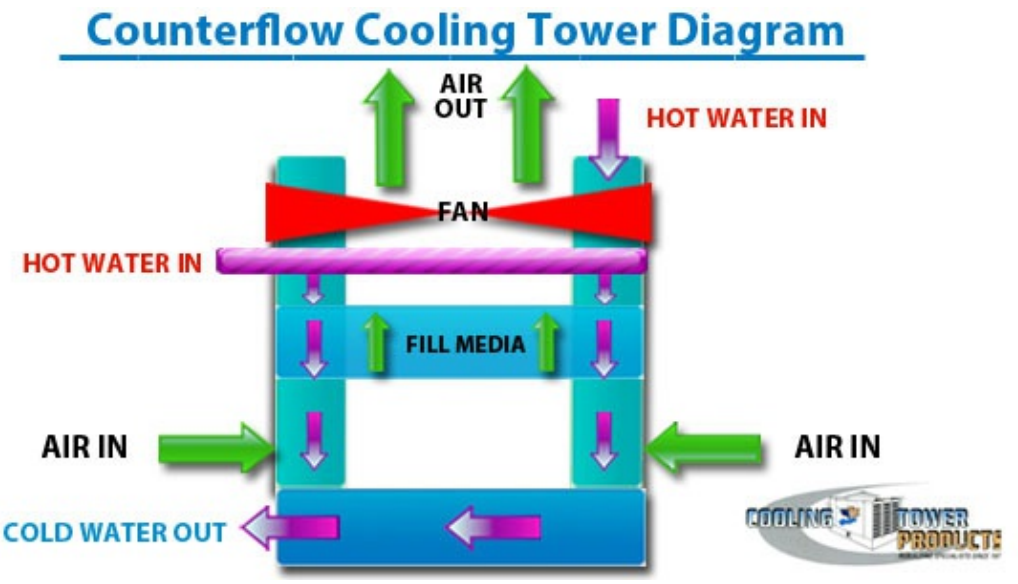
Counterflow Cooling Tower Diagram

Difference between crossflow and counterflow cooling towers: In counterflow cooling tower system processes, the air vertically flows upwards, counter to the water flow in the fill media. Due to the air flowing vertically, it's not possible to use the basin's gravity-flow like in crossflow towers. As a substitute, these towers use pressurized spray systems, usually pipe-type, to spray the water on top of the fill media. The pipes and cooling tower nozzles are usually spread farther apart so they will not restrict any air flow.



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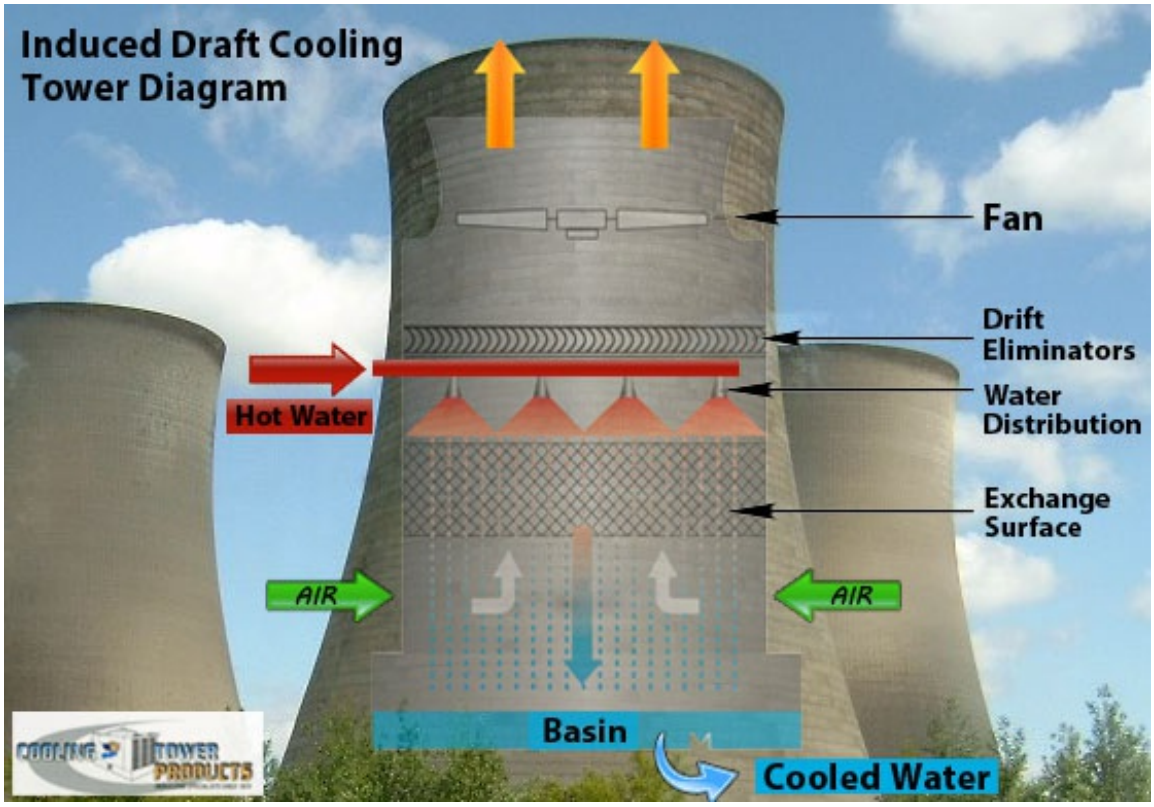
Forced Draft & Induced Draft Cooling Towers Process

Cooling tower fans are used on induced draft cooling towers to pull air up through the fill media. On forced draft cooling towers, the air is pushed/forced by blowers at the bottom of the air inlet louver.



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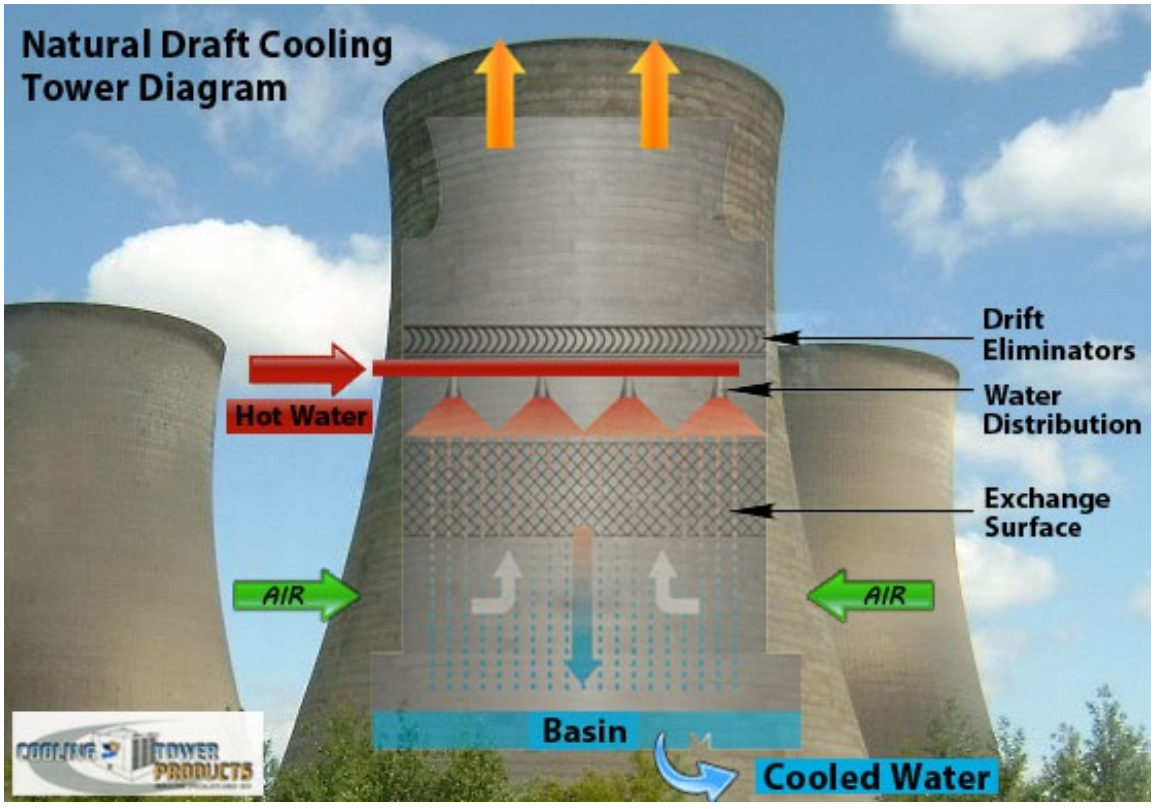
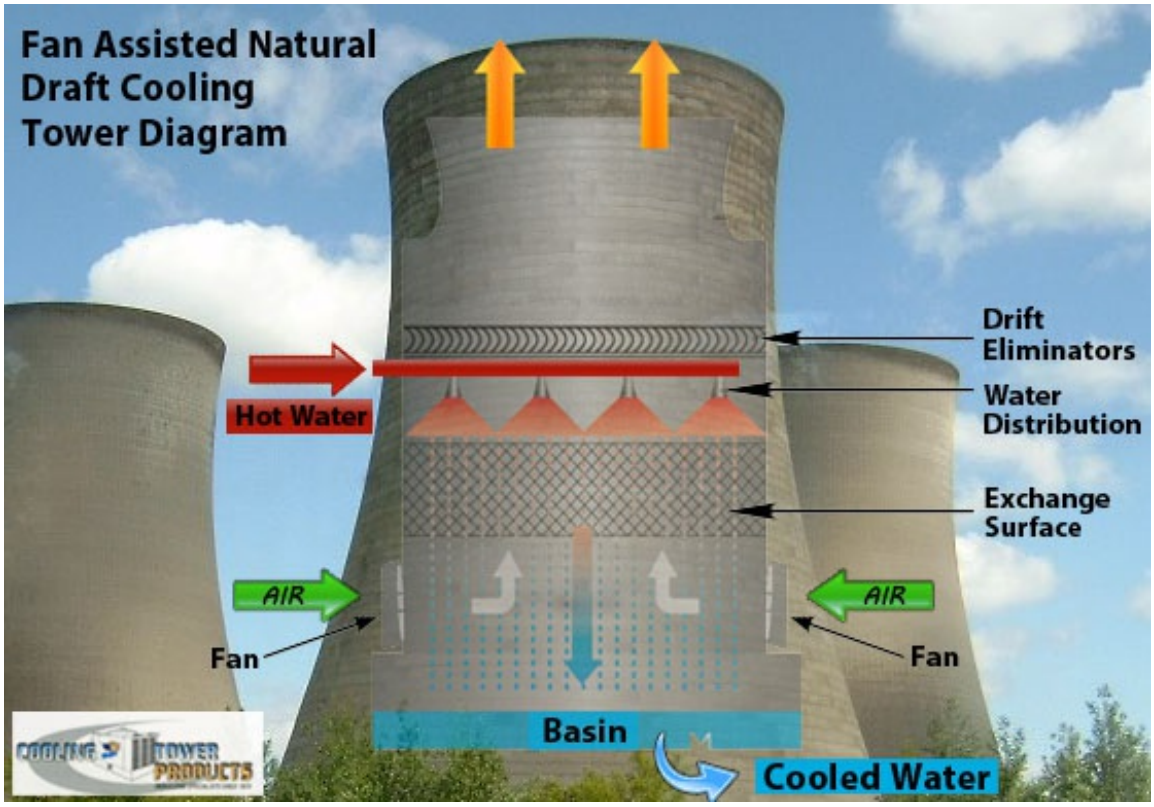
Natural Draft & Fan Assisted Natural Draft Cooling Towers





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Factory Assembled Cooling Towers (FAP) Factory Assembled Product

These factory-assembled cooling tower systems come somewhat disassembled and are shipped in a few sections, ready for final assembly or field erection. Although, small factory-assembled cooling towers can be shipped intact. FAP cooling towers can be induced draft, crossflow, forced draft or counterflow depending on the application its need for. TCIA cooling towers are widely used for light industrial applications and HVAC.

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Field-Erected-Towers (FEP) Field Erected Product

Field-erected cooling towers are usually constructed on the final destination site. The large FEP is usually prefabricated, marked by piece and shipped to the construction site for assembly. The cooling tower manufacturer usually handles all of the cooling tower construction process, final assembly, and labor involved. These type of towers can be counterflow or crossflow depending on the application. For heavy industrial applications or more power needed, field-erected cooling towers can be built to your exact specifications, structure, performance, plume abatement and drift.

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How are cooling towers relate to Atmospheric Vortex Engines?

Cooling towers are normally required to transfer the heat from power plants to other process and then to the atmosphere. By using the wasted stream of heat that is intended for cooling towers to generate vortex provides the idea of pulling out additional energy by

refusing the heat to the colder upper troposphere.

There is always potential to used wasted heat as additional fuel for atmospheric vortex engines whenever there is a cooling tower present or if there a abundant heat source available.

At the base of a natural waterspout, spray from warm sea water transfers sensible and latent heat to the rising air column. An atmospheric vortex engine simulates this natural heat transfer process using proven technology adapted from the cooling tower industry.

Although, there is a chance that you will need to make modifications to the tangential air inlet ducts.

These changes are required to make the air rise and create a spinning motion. It would only take a couple of minor modifications to convert cooling towers into atmospheric vortex engines.

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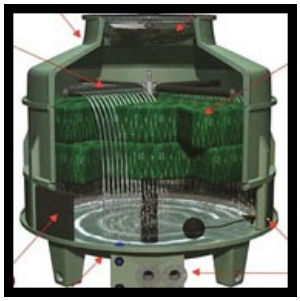
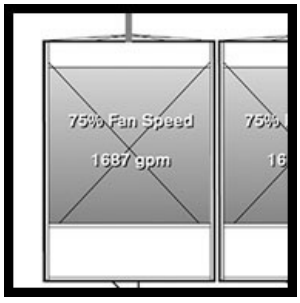
Cooling Tower Parts & Products

Here is the common cooling tower parts that might need to be repair or replaced during the life of your cooling tower.



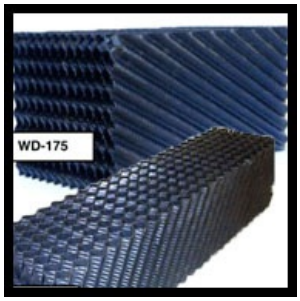
Systems designed for optimal performance - All components of cooling towers were originally designed to work together as a system for the longest life and best performance.



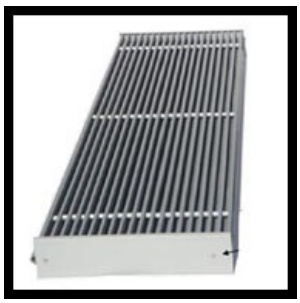
Variable Flow - Allowing your cooling tower to operate of variable flow has significant energy savings. Variable flow maximizes the efficiency of the tower capacity for which ever type of flow the cooling tower has.

Original Equipment Manufactured parts - TCIA OEM parts are manufactured at high standards and are built with high tolerances for a long life.

Gear Reduced Solutions - Gear boxes usually come in a variety of reduction ratios and designs in order to accommodate for the amount of horsepower and fan speeds of different types cooling towers. The manufacturer of your cooling tower usually lets customers order new gearboxes or have trained technicians that can repair or rebuild a faulty gearbox using original equipment manufactured parts.



Cooling Tower Fill Media - What is cooling tower fill media? Fill media is by far one of the most important cooling tower components. It could be considered the middle man of the entire process. Many of today's cooling towers use efficient plastic film fills or fill media that maximize the surface area for evaporative cooling processes. Water gets distributed onto the fill, which spreads into thin film. This process increases the water-air interface and allows extra heat to evaporate at a fast pace. The major factors in choosing fill media are TSS levels or Total Suspended Solids, intended treatment, water make-up and contamination potential. The 2 basic types of fill media are film type fill media (spreads the water out into a thin layer) and splash type fill media (breaks the water up). There is also fill media for specific types of towers such as crossflow fill media and counterflow fill media.

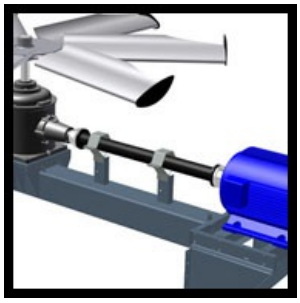


Cooling Tower Drift Eliminators - What are cooling tower drift eliminators used for? Cooling tower drift eliminators and heavy duty drift eliminators are parts of a cooling tower that are designed to remove droplets of water from the air and minimize loss of process

water. Drift eliminators cause the droplets and air to change direction suddenly. This process causes the water to become separated from the air and put back into the cooling tower.

Cooling Tower Nozzles - What are cooling tower nozzles used for? Cooling tower nozzles are most frequently used in crossflow cooling towers because they use gravity-flow distribution basins. With these types of systems, the water supply is raised to the distribution basins above the fill media and then flows down over the fill (by way of gravity) through the cooling tower nozzles in the basin floor.

Cooling Tower Fans - What are cooling tower fans used for? Cooling tower fans are used to force or push large amounts of air throughout the cooling tower. They must be built to withstand the corrosive effects in which the environment that they operate. These fans are usually loud but there are certain types of low-sound cooling tower fans. Cooling tower fans are used in crossflow, counterflow, induced/forced draft cooling towers. Natural draft cooling towers don't need fans because they use the natural air flow and different processes that cool the water.



Drive Shafts - What are cooling tower Cooling tower drive shafts used for? transmit power from the motor's output shaft into the gear reducer's input shaft. Drive shafts must also be corrosion resistant due to the harmful environment it which they operate.

Air Inlet Louvers - What are air inlet used for? Air inlet louvers or air intake louvers prohibit the sun light from entering the basin, which prohibits algae growth and lowers chemical costs. These louvers also lower the amount of splash-out, which lowers the volume of water and chemical use. Also, you will experience easier basin removal and access. The air inlet louvers in counterflow towers can sometimes become scaly if they are not correctly maintained and cleaned. Scaled louvers lessen the amount air flow which lowers the efficiency of the unit.

Electronic Float Valves - What are electronic float valves used for? Electronic Float Valves are design for cooling tower functionality, brass float valves and electronic water level systems have little maintenance with an extended life. Typically, there are electronic float valve kits available which include the float arm, float valve and float in kits to fit specific applications.

Cooling Tower Basin Heaters - What are cooling tower basin heaters used for? Cooling Tower Basin heaters prevent the cold water basin from freezing up during the winter weather conditions and can be used on Evapco, BAC, Marley and other industrial manufacturers' products. BAC basin heaters are CSA and UL rated. They have strong long lasting copper heating elements to ensure a long-life. The MPT connection is simple to fit into any cold water basin for closed circuit fluid coolers, cooling towers, and evaporative condensers.

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