Counter Flow Closed Circuit Water Cooling Tower

Operation Manual

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I. Working principle

The closed cooling tower cools liquids by means of heat absorption during water evaporation. The working fluid (softened water or another fluid) circulates in the radiator coil. Stored at bottom of the product, the spray water (cooling water) is evenly sprayed on surface of the cooler coil through a spray distribution system and a spray nozzle and forms water film. Some of the spray water is evaporated and the corresponding heat is absorbed by a fan, thus lowering temperature of the working fluid in the cooler coil. The water in hot air and the water that is not evaporated flow through the PVC heat exchange layer. The water in the PVC heat exchange layer is cooled by the air flowing through the PVC heat exchange layer, drops onto the bottom water pan and is pumped by a pump to the water distribution system for circulating cooling.

II. Range of application

The product applies to circulating cooling of the heat-producing equipment needing to be cooled down in fields such as power electronic devices, power-frequency furnace induction coils, medium-frequency furnace induction coils, medium-frequency power supplies, IGBT power supplies, resistor welders , laser devices, high-frequency devices, thermal treatment quenching mediums, molds, generating units, big hydraulic stations, food, chemical, air compressors, central air-conditioning systems, single crystal furnaces, continuous casting molds, glass furnaces, and domestic and foreign casting and auto parts processing.

III. Structure and properties

Both our combined flow closed cooling tower and counter flow closed cooling tower use copper pipes (stainless steel pipes) for heat-conducting components and discharge the heat produced into air by means of the heat exchange between air and water. It is a kind of new equipment that is actually a multi-layer calandria heat exchanger forming a high heat flux density and evaporating the heat produced in heat-conducting components.

1. **Structure**: A complete cooling tower mainly includes a main unit, auxiliaries and an electric control system as below:

(1) The main unit is mainly made up of a cooler, a plate (a catch basin), a spray system (a spray pump and a spray pipe), an exhaust system (a fan), a filler and a water collector (Fig. 2 counter flow type).

2. **Properties:** The product needs no water pool and its medium circulates in a closed way in the heat exchanger, ensuring clean water. It has the following advantages:

(1) High heat exchange efficiency: Heat can be discharged into air through one heat exchange only (it is twice for an internal and external circulating system).

(2) Small land occupation

(3) Less pipes and easy installation

(4) Extremely small medium (such as softened water) consumption: It needs no softened water generator but softened water added in a single time. After the water level drops, just replenish some softened water.

(5) High comparable cost efficiency: It needs one-time investment only, is free worries in use and has time and manpower saving easy operation and low maintenance cost, water consumption and electricity consumption, ensuring long steady productivity.

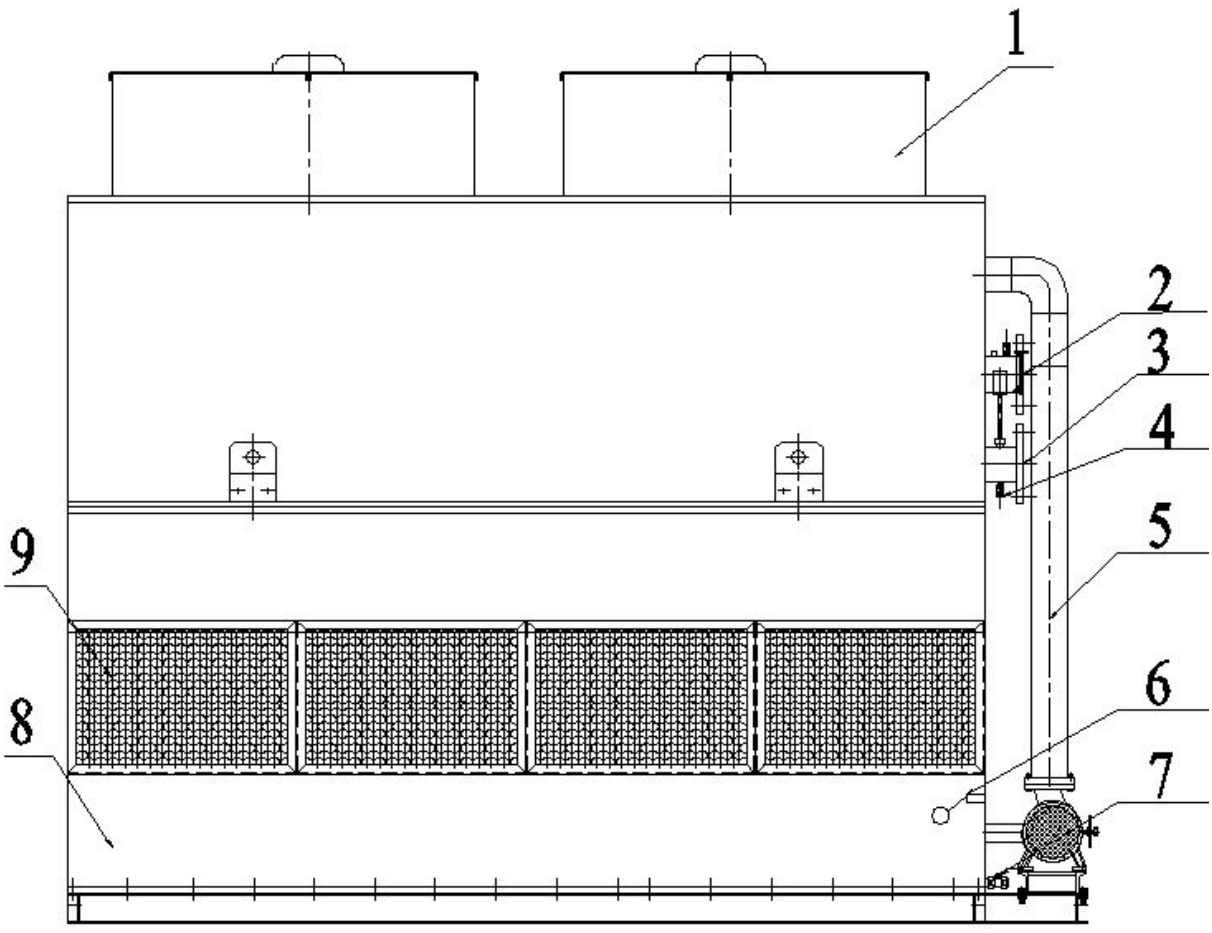

Fig. 1 (Outside View of Main Unit of a counter-flow Closed Cooling Tower)

1: Fan 2: Water outlet of cooler 3: Water inlet of cooler 4: Drain valve of cooler

5: Spray pipe 6: Automatic water replenishing port 7: Blow down valve 8: Spray water tank 9: Air-inlet grille

V. Transportation

1. It is suggested to lift the product during transportation. During lifting, use flexible slings. When the slings are in contact with the metal plates on sides of the water tank, try to avoid a large pressure on the water tank to avoid paint peeling of the metal plates. If necessary, support the product by poles before lifting.

2. No matter the product is transported in any way, handle it gently and do not excessively swing or collide it; otherwise it may be damaged, relevant persons may be endangered, etc.

VI. Installation

1. Choosing of storage site and installation site

For a longer life and reasonable use of the main unit, a foundation in line with the Foundation Drawing should be prepared for the main unit. The product should be installed under a rain shelter or a well ventilated room. The space in the air exhaust direction should not be lower than 2 meters in height, so as to make the hot air discharged by the main unit through the cooling fan fully exhausted into the exterior; the space in the air inlet direction of the lateral heat exchanger of the main unit should be 1.5 to 2 meters in height, so as to ensure normal service conditions for the main unit. The product should be horizontally placed on the foundation and enough space should be reserved around it for easy operation, inspections and maintenance.

2. If the machine room has a poor ventilation condition, use an air duct to lead the hot air generated by the product to an outdoor place.

3. Pipe installation

Elevation difference between the main unit bottom and the auxiliary (pumps and a water tank) bottom should not be larger than 0.2 meter. If this requirement cannot be met because of geographical conditions, contact us to avoid a serious consequence. The pipes should not be installed overhead but on or below the ground.

3.1 Determination of installation materials:

The product has been strictly tested and inspected before delivery, so user only needs to place it according to the site conditions or the product plan. The professional technician of user should carefully read the Schematic Diagram of Water Cooling provided with the product, determine lengths of the hoses, quantities and materials of the gate valves, the elbows, the loose joints, the straight fittings and tee fittings and the corresponding hoses and hose clamps and connect the cooling water pipeline system. To avoid an impact on water quality, the pipes and the corresponding accessories should be made of galvanized, PPR or stainless steel.

3.2 If any, we may send a professional debugging person to guide the installation.

3.3 If user installs the product by itself, its professional technician should refer to the Schematic Diagram of Water Cooling during pipe installation. (Fig.2 .3.4.5)

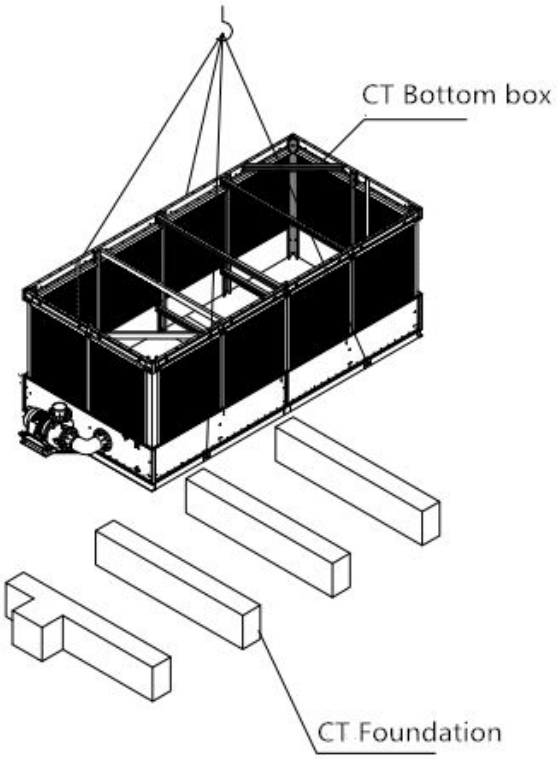

Figure 2

Lifting CT bottom box

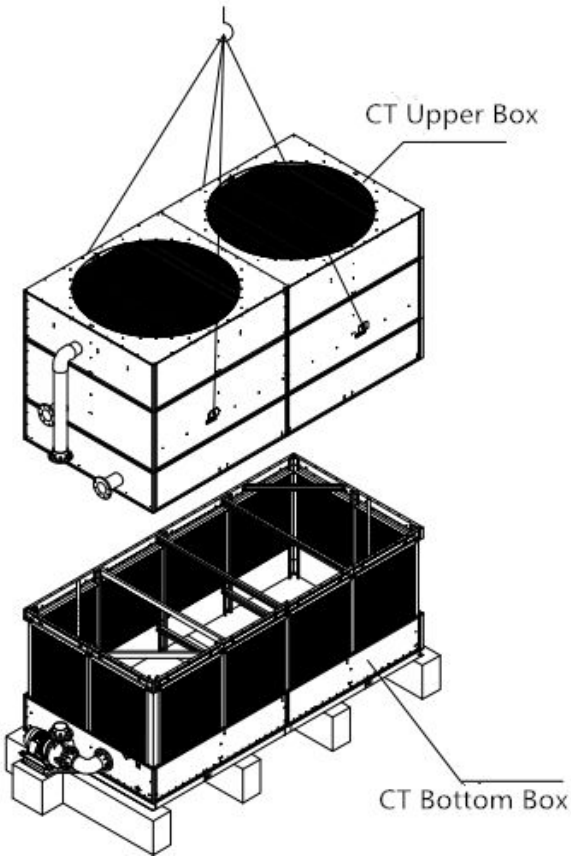

Figure 3

Joint the bottom and upper box of CT

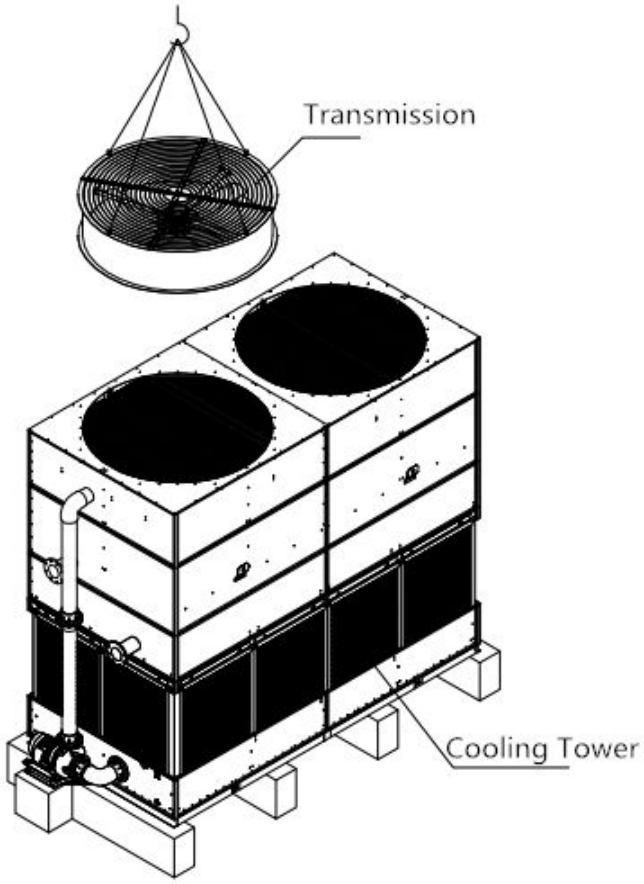

Figure 4

Install the transmission

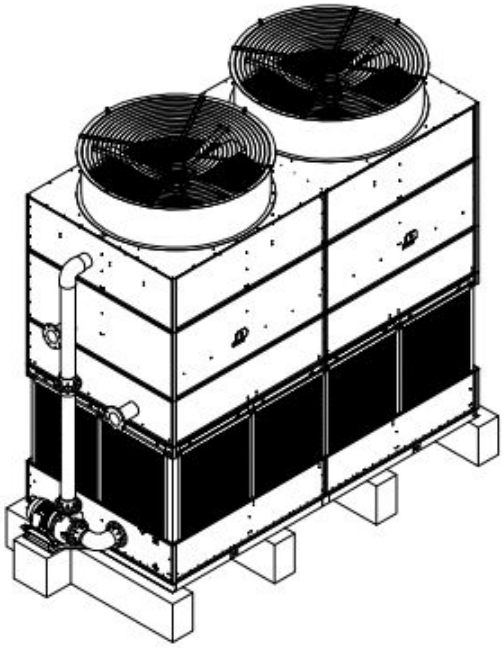

Figure 5

Cooling Tower Entirety

VII. Use and precautions

1. Preparations before power-on

1.1 Read the Instructions for Safe Use carefully and inspect whether the pipes are connected as required;

1.2 Inspect whether there are abnormal phenomena close to the product;

1.3 Inspect whether the power supply is properly connected (whether the phase voltage meets the voltage requirements for closed cooling towers);

1.4 Inspect whether all the wanted valves in the pipeline have been opened to corresponding

reasonable positions and whether the standby pump is closed;

1.5 Inspect whether the pump and the fan are rotating clockwise;

1.6 After the product begins to run normally, inspect whether the pump motor or the fan motor has overflow by an ammeter and, if it does, stop the product immediately and find and eliminate the reason before restarting the product. Do not start the product forcedly in this case because the pump motor or the fan motor will be burned because of overflow.

2. Operating steps of product control:

2.1 Make sure all the pipes and all the control wires have been properly connected, press the Start Main Pump button and the Start Fan button (if the corresponding lights are lit, it suggests that the main pump and the fan are both running) and observe whether the pump is running clockwise, whether the water flows in the arrow direction, whether the water pressure is normal, whether where is water leakage and abnormal sounds, whether the fan is blowing upward (if it is blowing in the opposite direction, interchange positions of any two of three wires of the fan) and whether there is an abnormal vibration sound and, if there is any problem, solve it immediately or, if you cannot solve it by yourself, contact us in time.

2.2 The spray system is an automatic temperature control system. When powering on the product, pull the spray switch to the AUTO position. The spray pump will then start and stop with rise and drop of the temperature. Parameters of the automatic temperature controller are usually set before delivery, so user does not need to change them freely; otherwise control over the automatic temperature controller tends to fail. If the temperature parameter needs to be changed, the technician of user must read the User’s Manual carefully before use, or operate under guidance of our professional technician.

2.3 Stop

Usually, to stop the product, just press the Stop Pump button and the Stop Fan button. The product will then stop. If the equipment to be cooled down is a diathermic furnace or a smelting furnace, do not stop the cooling system immediately after the diathermic furnace or the smelting furnace is stopped but after the hearth has completely cooled down. Thus, a time relay is provided for the cooling system. When powering off the product, set the time relay to the corresponding time according to the need, put the Time Relay switch in the ON position and stop the fan. Upon the set time, the pump will stop automatically. When being powered on again, the pump will resume

running automatically after the time relay switch is put on the OFF position, thus protecting the equipment (furnace) and saving energy.

Warning: Do not run the pump without water!

2.4 Automatic temperature controller

The product has an automatic temperature controller. After the water outlet temperature reaches the set maximum temperature, the automatic temperature controller will start the spray pump automatically; after the water outlet temperature drops to the set minimum temperature, the automatic temperature controller will stop the spray device and limit the water outlet temperature in the set range.

2.5 Reset after overheat protection

The electric control system is provided with a thermal overload relay for the fan motor and the pump water, respectively. Upon a protection motion, the red RESET button on the thermal overload relay at lower end of the corresponding AC contactor should be pressed till the end to realize reset after overheat; other the corresponding AC contactor pull in after the Start Pump button or the Start Fan button is pressed.

2.6 Water replenishment of the water tank

Observe liquid level display tube on the water tank. If the water level is lower than two thirds of the whole volume, replenish softened water in time.

3. Anti-freezing

Radiator of the product is made up of stainless steel pipes.

If the ambient temperature is below 0℃, an anti-freezing action must be taken because the water left in the stainless steel pipes after the product is stopped will ice up and burst. When the product is being installed, install a stop valve at its main water inlet and main water outlet, respectively, and at the main water inlet, connect the compressed air pipe with the air outlet.

The following anti-freezing actions may be taken.

3.1 Install the product in a place with an indoor protective temperature above 0℃.

3.2 If the product is installed outdoors (or in a place above 0℃), add some antifreeze into the stainless steel water tank and the spray water tank according to the volumes specified on User's Manual of the antifreeze.

3.3 Anti-freezing in winter:

Blowing by air: If the product will not be used in winter, close the valves at its inlet and outlet, open the exhaust valve, feed compressed air into the cooler directly and, upon a pressure of 4 kilograms to 5 kilograms in the cooler, close the air inlet valve and open the drain valve to drain water and air out of the cooler and, after the air pressure returns to zero, close the drain valve. After three successive times of blowing with this method, water in the cooler will be blown out thoroughly and the copper pipes in the cooler will not be frozen off during icing.

The following content is for reference about anti-freezing.

A. Significance of anti-freezing:

If the product is installed indoors or outdoors in winter and the ambient temperature possibly drops below 0℃, an effective anti-freezing action must be taken. This is a simple and effective equipment protection method. It reminds user to take an anti-freezing action before winter.

B. Choosing and usage of antifreeze:

There are numerous antifreezes with diversified quality on the market. User should choose a famous brand. Antifreezes mainly include glycol and their quality mainly depends on their glycol contents (the antifreezes with a high glycol content have high quality).

User may purchase an antifreeze from an chemical manufacturer.

The antifreeze has simple usage. Its consumption mainly depends on the low temperature needing an anti-freezing action. Refer to the directions for use on its outer package for its specific proportion.

C. Antifreeze’s impact on the product and substitute:

According to relevant theory and our practice, antifreezes have no corrosion impact on the product; however, they increase the conductivity a little. A totally closed pure water circulation system is used and pure water has extremely low conductivity, so antifreezes have acceptable impacts and can be used securely.

If no proper antifreeze can be bought when needed, it can be temporally substituted by industrial alcohol; however, alcohol is highly volatile and has possibly volatilized completely some time later and cannot realize an anti-freezing effect. User should adjust correspondingly according to the actual condition.

D. We do not provide antifreeze. The antifreeze proportion should be determined according to

relevant requirement of the manufacturer.

VIII. Maintenance

1. Keep surface of the radiator coil (cooler) of the product clean, make sure a good ventilation condition close to the product, clean the spray filter at regular intervals and, to avoid impacts on the air volume and the cooling effect, remove such impurities on the heat exchanger as dust and oil stains at regular intervals.

2. If the product has been out of service for some time, the pump impellers may be solidified by the water dirt deposit. When restarting the product in this case, loosen the pump motor first to avoid fuse burn because the pump impellers fail to rotate.

3. After the product has been used in a dusty place for some time, the outer walls of its stainless steel will possibly scale, thus weakening cooling capacity of the product.

IX. Common faults

Fault	Possible cause	Elimination method
The main pump or the spray pump cannot be started.	1. The voltage is low or the power supply has an open-phase problem; 2. The pump and the impellers are seized; or 3. The product is not reset after overload protection.	1. Eliminate the circuit fault and transit power according to requirement of the product; 2. Remove the motor hood and manually turn the motor impellers; or 3. Press the overload protection reset button.
The main pump or the spray pump discharges no water or has an insufficient pressure.	1. The pump rotates anticlockwise; 2. The impellers are blocked; or 3. Valves of the standby pump are not closed.	1. Correct rotating direction of the pump motor; 2. Clean and inspect the pump impellers; or 3. Close all the valves at inlet and outlet of the standby pump.
After long-time use, there is	1.The spray pump is	1. Clean impellers of the

no enough spray water.	blocked; 2.The spray pipe scales seriously; or 3.The filter is blocked.	spray pump; 2.Clean and inspect and spray pipe nozzle; or 3. Clean or replace the filter.
After long-time use, the circulating water temperature is too high.	1.The cooler copper pipe scales; 2.The spray system is not working; or 3. The fan has failed.	1. Descale the cooler copper pipe; 2. Inspect whether the automatic spray system is working; or 3. Inspect whether the fan is working.
The temperature controller displays a wrong or too high temperature.	1. The platinum thermistor has a wrong phase sequence or wire breakage; or 2. The platinum thermistor has intertwining wires.	1. Correct the phase sequence and connect the circuit; or 2.Sort or reweld wires of the platinum thermistor.
The circulating system needs continuous water replenishment.	1. The cooler is leaking; or 2. There is obvious leakage on joint(s) of the cooled equipment.	1. If the cooler is leaking, contact our after-sale service department; or 2. If the fault is not caused by either of the two causes in the “Possible cause” column, inspect whether your pipeline is buried underground. The fault may be a result of pipeline leakage.

X. Quick-wear parts

1. Ball valve (for water replenishment to the water tank)
2. Mechanical seals of pumps
3. Fan motor
4. Exhaust valve and water tank’s drain valve
5. Air switch
6. AC contactor
7. Thermal overload relay
8. PT100 platinum thermistor
9. Liquidometer

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