



蒸发式冷凝器
闭式冷却塔
空气冷却器



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闭式冷却的优点及应用实例

The closed circuit cooling advantage experience



闭式冷却塔应用实例 >>> Applications in engineering

闭式冷却塔是无数商业和工业过程冷却中经常被采用的，一些实例如下：

Closed Circuit Cooling Towers are routinely selected for numerous commercial and industrial process cooling applications. Some examples include:

- 水源热泵
Water-source heat pumps
- 独立冷却设备
Self-contained cooling units
- 制冷主机
Chillers
- 自然冷却应用
Free cooling applications
- 数据处理中心
Data centers
- 混合式蒸发式、干式冷却
Hybrid evaporative/dry cooling
- 对特殊液体的冷却
Cooling special fluids.
- 压缩机套体冷却、中间冷却、后冷却
Compressor jacket cooling Intercooling, Aftercooling.
- 机器套体冷却
Machine jacket cooling
- 感应炉冷却
Induction furnaces
- 单台冷却设备对多类负荷进行集中冷却
Consolidating multiple loads into a single cooling unit

闭式冷却塔的优点 >>> The closed circuit cooling advantage

对于最终用户来说，由于闭式冷却系统将工艺流体保持在一个清洁的闭式回路中，从而具有许多操作上的优势。

Closed circuit cooling systems provide many operational and maintenance benefits to the user by keeping the process fluid in a clean, closed loop.

- 保证工艺流体不被污染 (Protect process fluids from contamination)
- 降低结垢的可能性，将系统效率提高到最大的程度
(Maximize system efficiency by reducing fouling and scaling tendencies)
- 降低系统能耗成本 (Reduce system energy costs)
- 降低系统维护成本 (Reduce system maintenance costs)

闭式冷却比其它排热形势的优点 >>> The closed circuit cooling advantage

与开放式冷却塔+热交换器组合相比

(Vs. Cooling Tower+Heat Exchanger Combination)

更接近空气湿球温度，并减少了结垢现象，提高了工艺的效率。

Closer approach to wet bulb and reduced fouling improve process efficiency

与空冷系统相比 (Vs. Air-Cooled Systems)

工艺温度降低了10—20°C，占用空间更小，能耗更低。

10—20°C lower process temperatures, less required space, and lower energy consumption.

与开式冷却塔相比 (Vs. Open Cooling Towers)

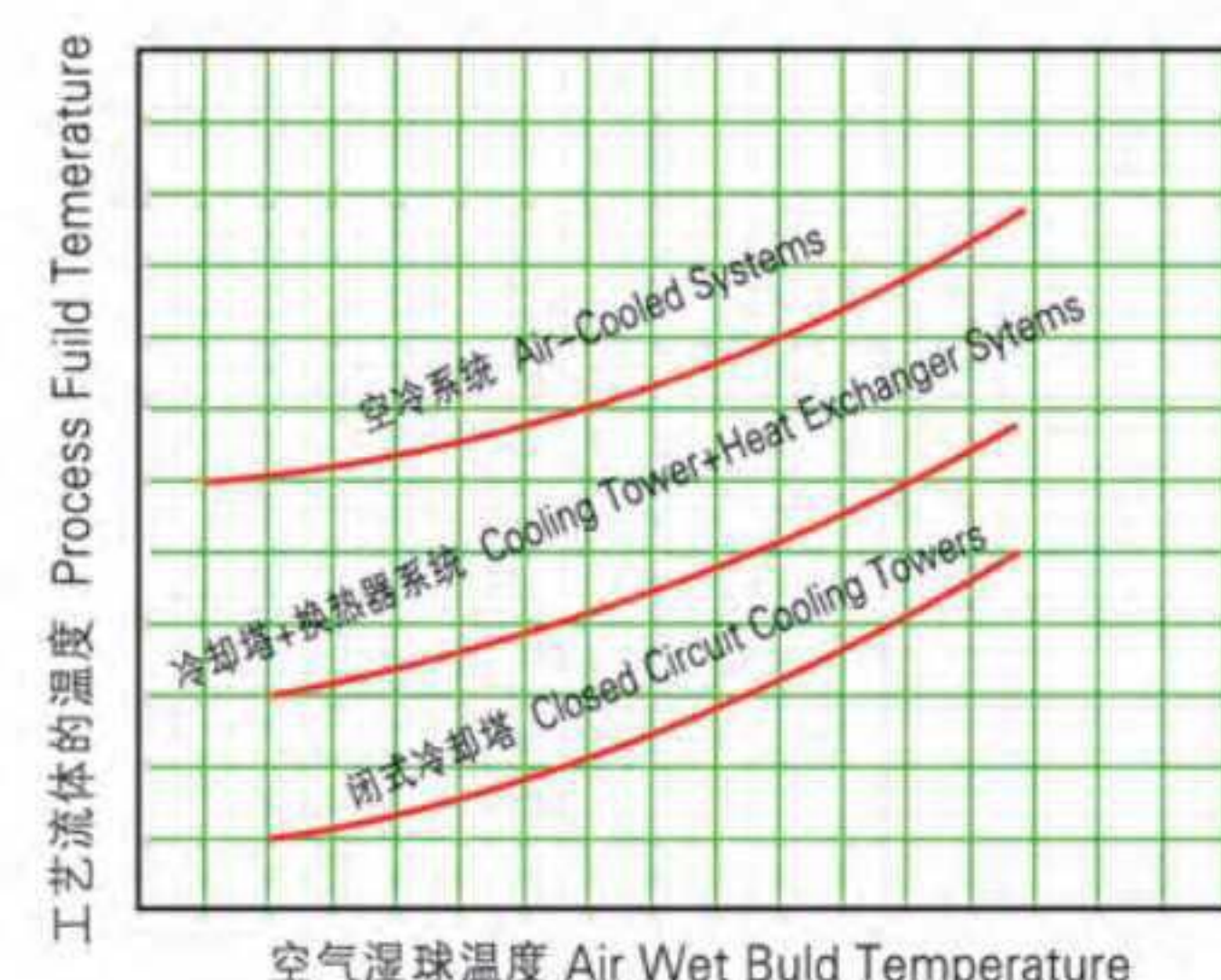
不含污染物的闭式冷却能够大幅度的降低工艺过程中的结垢现象，从而确保在长期运行下恒定的工艺性能。

Contaminant free, closed loop cooling significantly reduces process fouling, ensuring constant performance over time.

与一次性用水系统相比 (Vs. Once-Through Systems)

减少对环境的不利影响，节约95%的冷却水。

Reduces environmental impact, saving up to 95% of the cooling water.



降低安装费用，减少占地空间。

Reduced Installed Cost And Space Requirements
将冷却塔和换热器的功能有效的整合到单台设备中，降低了管道和系统布置的复杂程度。

Effectively combines the function of a cooling tower and heat exchanger into one piece of equipment, reduces required piping and system complexity.

复合流系列 Mixed flow series



工作原理 >>> Process principle

工作流体在盘管中流动，盘管外壁被喷淋水包裹，流体的热量通过管壁传递与水空气形成饱和湿蒸汽，热量由风机排入大气，水分被挡回水槽循环喷淋，消耗量极少，喷淋水在循环的过程中通过PVC散热片降低水温，与新鲜入风形成风水同向流动。盘管主要依靠显热传导方式，特别适合于高温流体的冷却。

Working fluid is flowing inside of the coils, which is wrapped by spray water on the outside. The heat of water is transferred by coil and become the saturated vapor when meet the water and air. The heat is exhausted out of the tower by the fan; water is collected back to the bottom tank. The spray water is cooled down via PVC radiation fin in the process of circulation, and flows in the same direction with the fresh wind. The coil mainly takes sensible heat travel tylse. And this will apply especially to dealing with high temperature fluid.

产品特点 >>> Product Characteristics

● 维修方便 (Easy to maintain)

巨大的维修空间，为设备的检修提供变革性的便利，可在运行条件下通过检修门入塔内维修。

The huge inside spare space is convenient for people to get into and examine and fix.

● 防止结垢 (Avoiding scaling)

较佳的水覆盖与管外表，由于空气和喷淋水以顺畅、平行和向下的路径流过盘管表面，维持了完全管外覆盖。从而消除了有利于水垢形成的干点。

Better water coverage around the tubes is due to air and spray water flowing in smooth, parallel, downward path over the coil, promoting dry spots since the water is not stripped from the underside of the tubes by the airflow.



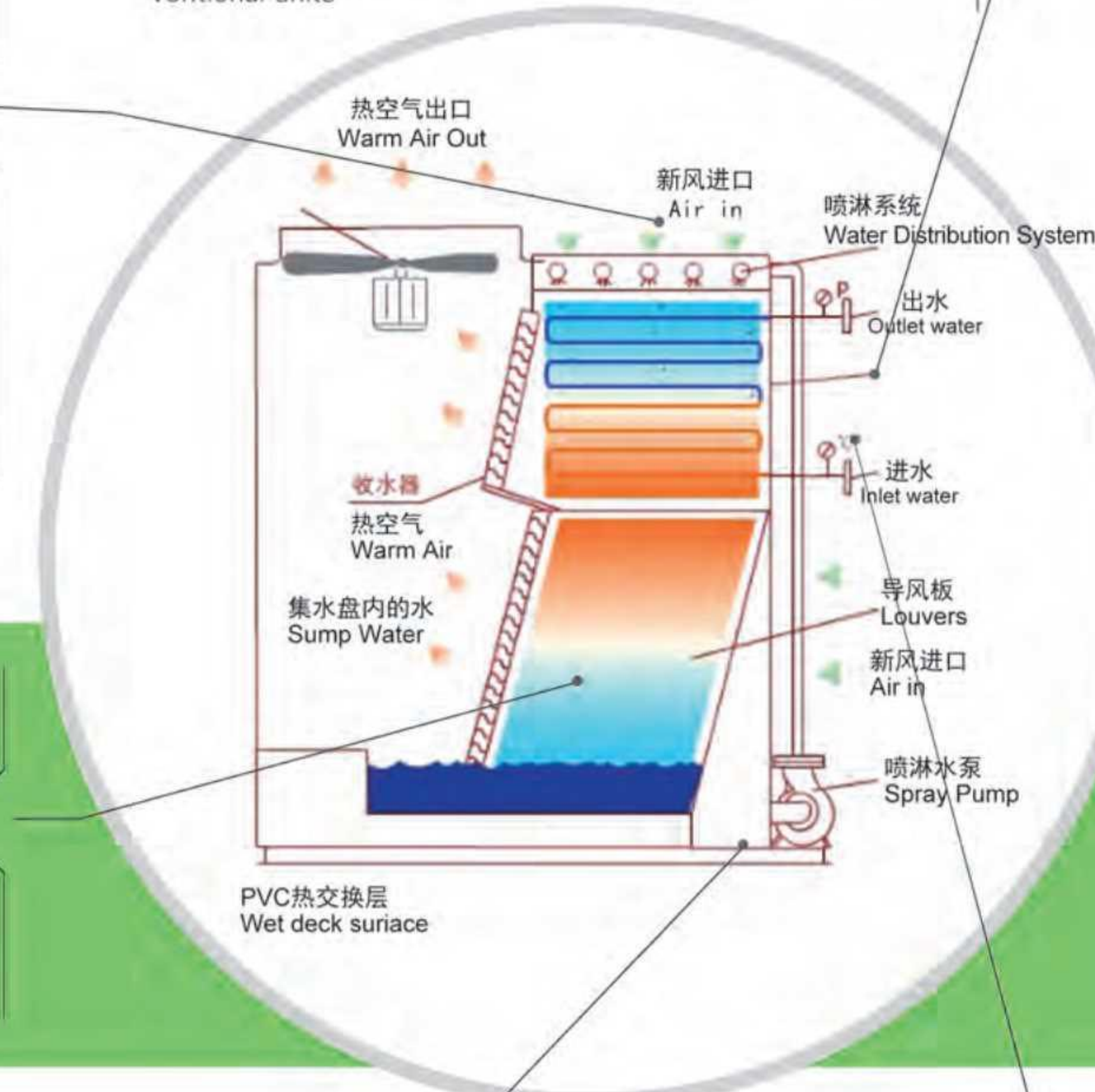
闭式冷却塔工作原理图 >>> Closed circuit cooling towers Principle of operation

冷却后的喷淋水增加了水和较热的工艺流体之间的温度差，从而降低了盘管的尺寸，减少了盘管的连接点并减轻了盘管的重量。该特征更进一步减缓了在盘管表面形成结垢的趋势，这是由于较低温度的水在结垢后形成的合成物上提供了较高的溶解度。

The cooled water increases the temperature differential between the water and the warm process fluid, which results in a reduced coil size, fewer coil connections, and reduced weights. This feature further reduces the tendency to form scale on the coil since cooler water offers higher solubility for scale producing compounds.

平行的气流和水使传统设计的设备在管子底部出现的能够导致结垢的干点现象降低到最低程度。

Parallel air and water paths minimize scale-producing dry spots that may be found on the bottom of tubes in conventional units



路喷淋水从盘管上落至PVC换热层上，并于PVC换热层上由第二股新鲜空气通过蒸发和显热式的热传导进行冷却。

The recirculating spray water falls from the coil to the wet deck surface section where it is cooled by second fresh air stream using both evaporative and sensible heat transfer processes.

将流量最小为6.5l/m²的水通过水泵打到盘管表面上，以确保主要的传热表面上连续浸润的状态，从而提高热传导率，并将结垢降低到最低程度。

Water is pumped over the evaporative coil at a 6.8l/m² of coil face area to ensure continuous flooding of the primary heat transfer surface which enhances heat transfer efficiency and minimizes fouling and scale formation.

盘管段一方面通过新鲜空气的蒸发冷却作用来散热，另一方面更大程度的通过预冷却喷淋水的显热冷却作用来散热。降低盘管中蒸发冷却的部分有助于减少盘管表面结垢的可能性。

The coil section rejects heat through both evaporative cooling using the fresh air stream and, more significantly, through sensible cooling using the pre-cooled re-circulating spray water. Reducing this evaporative cooling component from the coil helps to minimize the propensity to form scale on the coil surface.

逆流系列 Counter flow series

工作原理 >>> Process principle

进风形式为底部逆流进风，与下落的喷淋水逆向交替形成饱和湿热空气，热量由顶部风机排出，水份由特殊结构的脱水器回收集水槽循环使用，内部空间没有换热填料，腾出更多的空间增加盘管的单位散热面积，结构更紧凑、占地小。特别适合用于温度较接近当地湿球温度的情况。

The air intake style is inlet from the bottom of the tower, which is a lternating direction interative with the fall down spray water and form to saturated vapor in the process. The heat is exhausted out of tower by the fan and the water is collected to bottom tank and circulate continuously by the special evaporator. There is no heat sinking fillings inside of the tower, so more space is saved to increase coil' radiating area. Tight structure lead tolittle area take up. This apply especially to dealing wih low temperature fluid.

产品特点 >>> Product Characteristics

● 结构更紧凑 (Tight structure)

由于减少了换热填料的空间，使得该类型设备结构更加紧凑，占用空间更小，运输安装方便。更适合用于环境恶劣的场所，如炼铁厂，铸造厂及各类厂矿企业。

Without heat exchange filling, makes the structure of this type unit tighter, less occupied space. More suitable for being used in severe environments such as Steel-making Factory, Flundry, Mine Factory ect.

● 椭圆管设计 (Elliptical Tube Design)

换热管设计成椭圆管，排列更为紧密，相比圆管流体充注量更少，同时可以降低空气的流动阻力。

Compared with round tube, using elliptical tube as heat exchanger coils can make the form tighter, less filling rate of liquid and less air flow resistance.

● 预冷翅片设计 (Precooling Fin Design)

可增加预冷翅片，实现高温预冷和低温停水，更适合严重缺水地区。

We can increase the precooling fin on the cooling tower, Precooling of high temperature or stop the water at low temperature. More suitable for serious water shortage area.



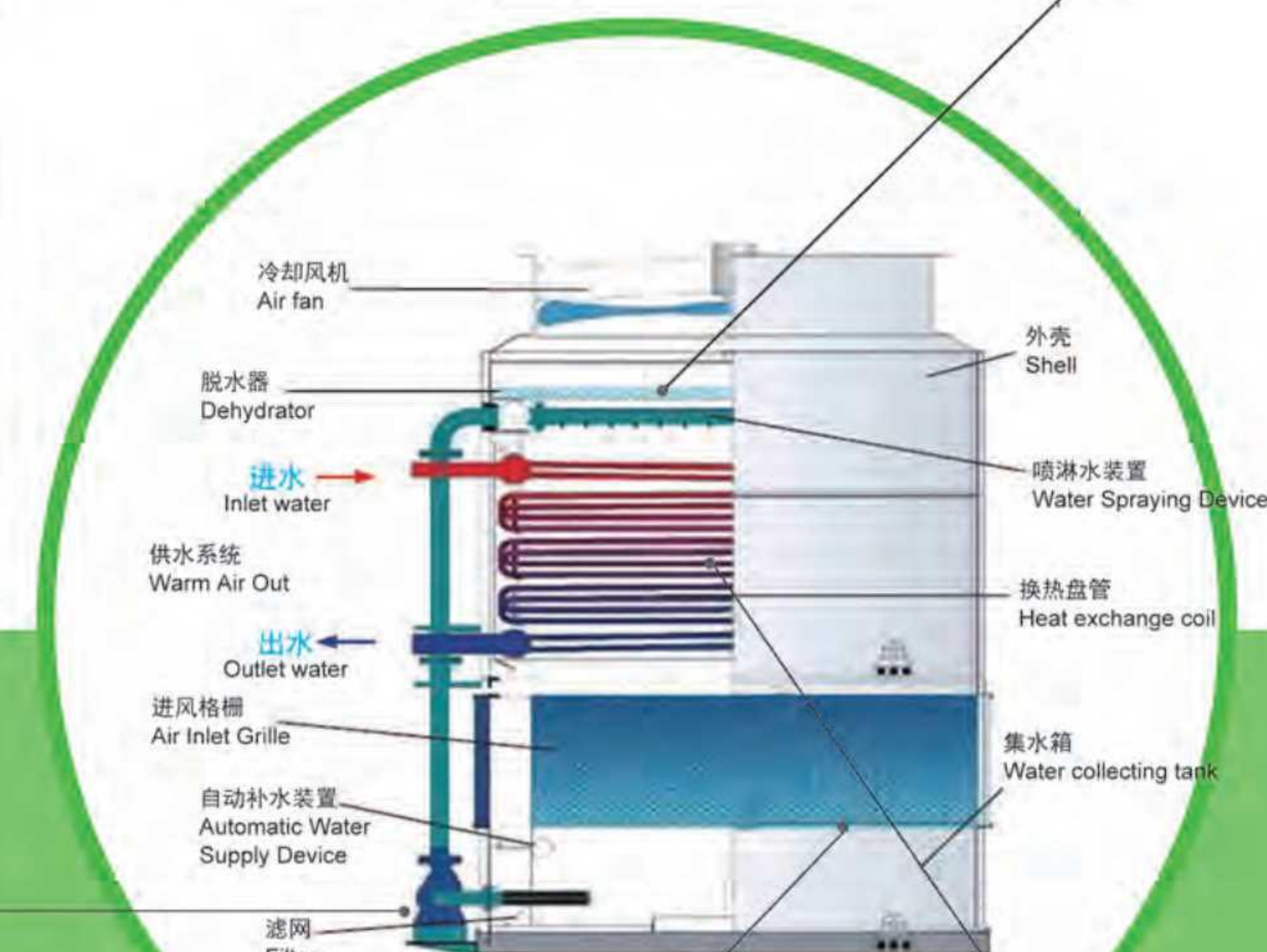
闭式冷却塔工作原理图 >>> Closed circuit cooling towers Principle of operation

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Water is pumped over the evaporative coil at a 6.8l/m2 of coil face area to ensure continuous flooding of the primary heat transfer surface which enhances heat transfer efficiency and minimizes fouling and scale formation.

高效的脱水器，由PVC材料制成，可去除排出气流中夹带的水滴，耐辐射，寿命长。并在脱水器侧面板开有检修口。

High-effect water eliminator is made of PVC, can filter the drips from expelted airstreams. Radiation-enduring and long lifespan.



最新改进的进风格栅，进入水盘时拆卸方便，防止阳光直射，并避免了水藻的产生，防止灰尘和脏物进入机组。

Easy removable air inlet grating avoids sun projectivity dust and dirt coming in.

在管子内可能沉积可溶性污垢或污泥的条件下，采用可清洁式集箱盘管束。

For applications that might deposit soluble scale or sludge within the tubes, the cleanable header tube bundle provides removable cover plates

闭式冷却塔结构及主要部件说明 Structure and main parts

风机 (Propeller Fan)

TYBH/TYBN 系列闭式冷却塔采用冷却塔专用铝合金轴流风机，前倾式风叶结构设计，流线型入口风筒，风阻小、风量大、噪音低、性能佳、效率高。无皮带传动的结构，减少了传动部件，并采用全封闭自冷式低噪音蒸发冷专用电机，具有体积小、重量轻、启动性能佳、运行可靠、经久耐用等优点。

The ventilating system of TYBH/TYBN adopts the aluminum alloy propeller fan dedicated for cooling tower with high blowing rate, low damping, low noises, good performance and high efficiency. The motor is closed and self cooling. It has the advantages of small size, light weight, good start ability, reliable operation, long lifetime and so on.



循环泵 (Water Circulating Pump)



循环泵采用不受转向限制的优质机械密封，无泄漏，寿命长。并选用专用户外电机，特殊配置的进口轴承保证机泵长期可靠运行，具有小功率，大流量，低噪音，性能优异等特点。

It is sealed by good machinery without any leakage. It adopts Special outdoor motor. And the imported bearing with special collocation can ensure the pump along time steadily run. It has the advantages of low power rating, large discharge, low noises and excellent performance etc.

采用进口镀锌锌板 (Imported board of Zinc-plate and Aluminum-plate)

产品外壳采用进口镀锌锌板，它是当今耐腐蚀性能最强的板材之一，使用寿命是普通镀锌板的3~6倍。并且具有阻热性强、耐热性高、外表美观等优点。

The outer shells Series Products are all made of imported board of Zinc-Plate and Aluminum-Plate with the best stain resistance. Its lifetime is 3 to 6 times of that of the common ones. This kind of Stain steel has the advantages of strong heat resistance and beautiful appearance.

盐酸喷雾1000小时试验及曝晒试验



普通镀锌板

镀锌铝锌板

17年户外曝晒

表冷器 (Condensing coils)



表冷器由优质的无缝流体管制成，冷却盘管组的整体热浸锌处理，增强了盘管防腐能力，延长了使用寿命，盘管沿制冷剂流向倾斜便于液体排出，盘管压力降低。

表冷器可根据管内介质选用不锈钢、T2紫铜材质制作。

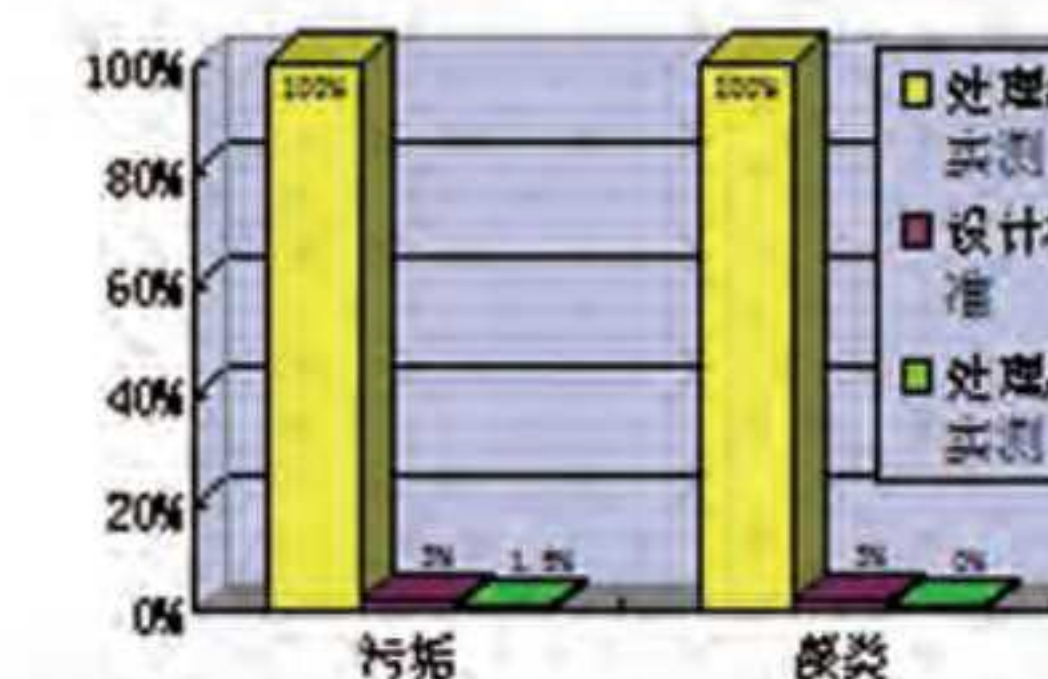
表冷器可根据工艺要求选用椭圆管、翅片管、波纹管、复合型表冷器等型式。

The condensing coils are made of high-quality seamless steel pipes. The coils are galvanized to avoid being rotten. The slope of coils helps the discharge of liquid. The differential pressure of the coil is small.

电子水处理仪 (Electronict Water-Curing Device)

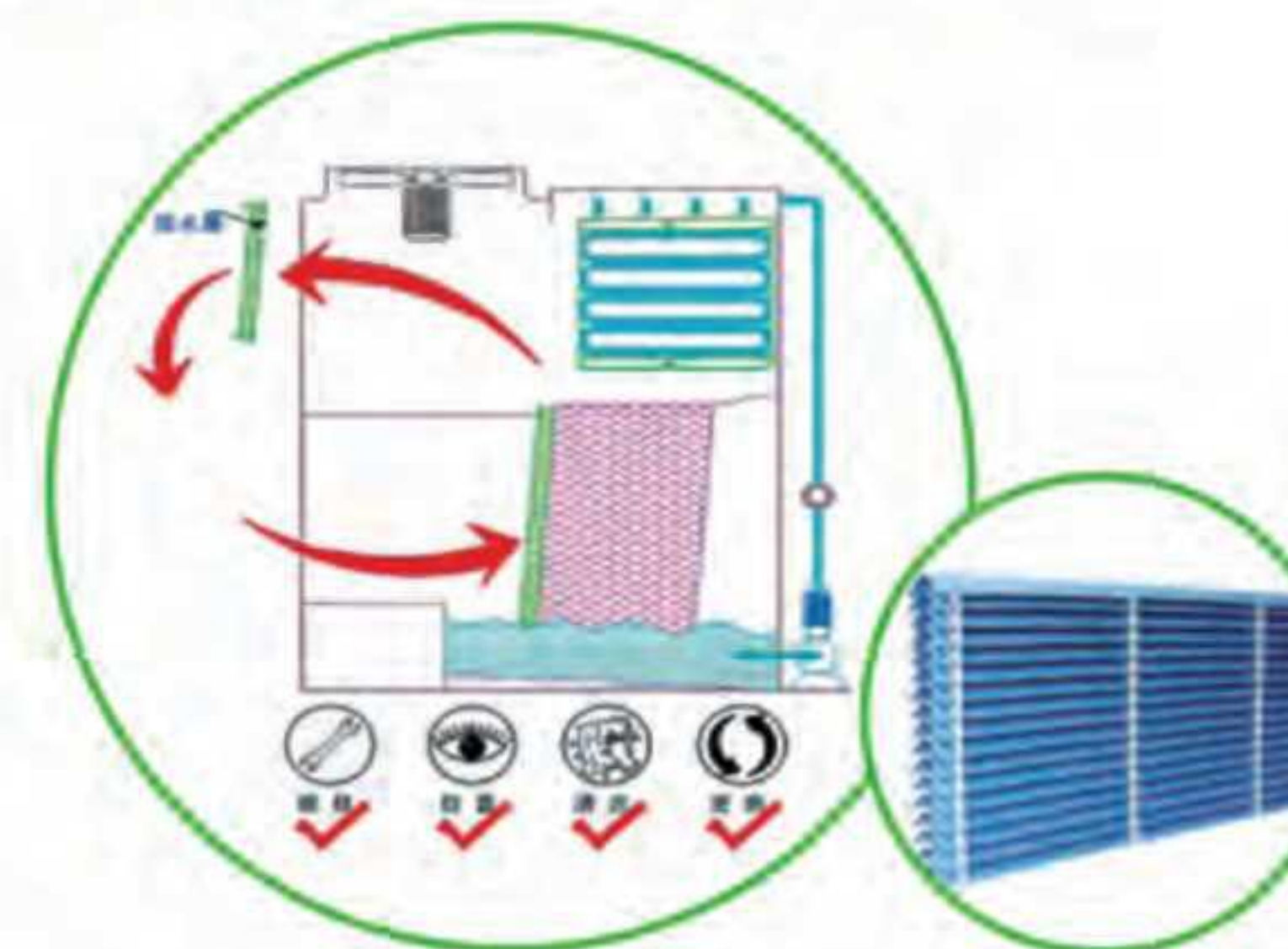
配置先进的电子水除垢仪，其利用电子脉冲技术对循环水进行防垢除垢、杀菌灭藻的处理。您只需接通220V电源即可对循环水水质进行处理，有效的避免了盘管壁、填料上污垢的形成。

The electronic water-curing device is very advanced and works under 220V power supply. It can help the condenser to antiscaling, descaling, sterilize and eliminate alga, activating the circular cooling water.



注：此表据上海交通大学低温研究与测试中心数据绘编

可拆式除水器 (Set Up Dehydrator)



产品独创的可拆式除水器采用耐腐蚀PVC材料，其结构通过改变气流流向，能有效地去除从盘管中出来的湿空气水份，使水的飘逸率降低至0.01%以下。当清洗填料时，可方便的将除水器卸除。

The dehydrator series products is made of specially designed non-corroding PVC material. The special structure can get rid of the air moisture coming out from the coil pipe in order to Change the air current 0.01%. It is very convenient to disconnect the dehydrator when cleaning the filler.

先进的水分配系统 (Advantage Water Distribution System)

产品冷却水喷淋系统采用大流量防堵塞的提篮式喷嘴，保证了布水的连续均匀喷洒在盘管表面上的水，在引风的作用下让水最大限度的覆盖于盘管表面，使水、空气与制冷剂充分进行热交换，从而提高了传热效果。喷嘴扣接于喷淋支管上，当清洗喷嘴及喷淋支管时可方便将其拆卸。

Cooling water spray system adopts large discharge and anti-blockage nozzles, which can ensure the cooling water furthest contact the condensing coil and hence overcome the fouling and promote the moisture to vaporize, thus improve the effect of heat transfer. The nozzles can be easily disconnected from spray branch pipes when cleaning.



PVC填料热交换层 (PVC Wet Deck)



特殊设计的PVC蜂窝式横流填料，捷径的横进风结构，使空气能迅速带走水中的热量独特的填料流道，使水流在填料表面能形成大面积的流动水膜，延长了水在填料里的冷却时间，提高了水冷却效果。具有风阻系数小、抗老化、不易变形等优点。

BHX series products adopt PVC honeycomb type stuffing. The short horizontal air-inlet design can help the cool air take away the heat of water immediately. Special filling pipe can make water change to float water velum. It will prolong the time of the water staying in pipe and it will have good heat exchanging effect. And it has the advantages of aging resistance, deforming resistance and low wind resistance coefficient, etc.

闭式冷却塔设备参数 Closed Cooling Tower Selection

 TYBH系列复合流闭式冷却塔工程参数表 >>>

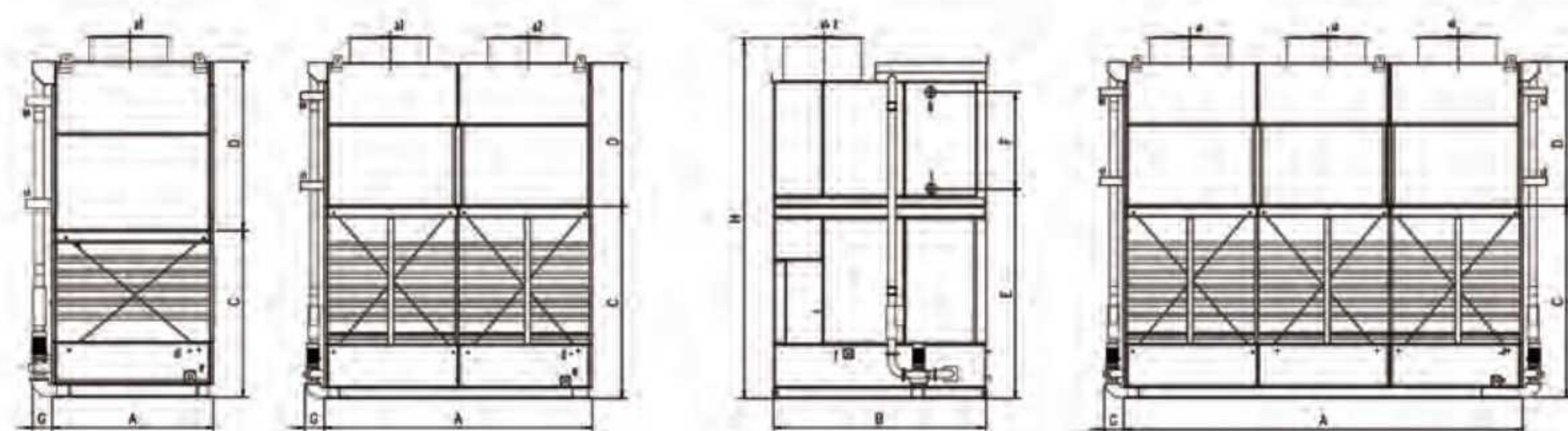
型号 Type	名义处理量 Flow ref lection	风机功率 FAN MOTOR (kW)	风量 AIR FLOW (m ³ /h)	水泵功率 PUMP MOTOR (kW)	淋水量 AMOUNT OF WATER (m ³ /h)	接管口径 INTAKE/EXPORT DN (mm)	近似重量 APPROX. WEIGHT (kg)		外形尺寸 DIMENSION		
							运输重量 SHIPPING	运行重量 OPERATING	总长 length	总宽 width	总高 height
TYB-30H	30	3	46000	0.75	28	DN80	2320	3660	1785	2380	4220
TYB-40H	40	4	60000	1.1	45	DN80	2340	3680	1785	2380	4220
TYB-50H	50	5.5	75000	1.1	45	DN100	2700	4750	1925	2380	4220
TYB-60H	60	7.5	87000	1.5	65	DN100	3320	4990	1925	2980	4240
TYB-75H	75	7.5	100000	2.2	65	DN100	3810	5900	1925	2980	4870
TYB-85H	85	2-4	2-65000	1.5	100	DN100	4650	7290	3490	2380	4240
TYB-100H	100	2-5.5	2-72000	2.2	100	DN100	4960	7630	3770	2380	4240
TYB-125H	125	2-5.5	2-75000	3	140	2-DN100	6090	10230	3770	2580	4870
TYB-150H	150	2-7.5	2-87000	3	140	2-DN100	7070	11270	3770	2980	4870
TYB-175H	175	3-5.5	3-75000	4	180	2-DN100	8050	13920	5610	2380	4965
TYB-200H	200	3-7.5	3-87000	4	180	2-DN100	8830	14730	5610	2580	4965
TYB-225H	225	3-7.5	3-87000	5.5	233	2-DN100	9790	16050	5610	2980	4965
TYB-250H	250	3-7.5	3-100000	5.5	233	2-DN125	11020	17380	5610	3420	4965
TYB-300H	300	3-11	3-125000	5.5	233	2-DN125	12050	17450	5610	3420	4965
TYB-350H	350	4-7.5	4-100000	7.5	286	2-DN150	15200	22900	7450	3420	4965
TYB-400H	400	4-11	4-125000	7.5	286	2-DN150	15700	23700	7450	3420	5150
TYB-450H	450	4-11	5-125000	2-4	2-180	2-DN200	16020	23900	7450	3600	5150
TYB-520H	520	5-11	5-125000	2-5.5	2-233	2-DN200	18500	27650	8860	3600	5150

注意:

1. 该数据不可用于制造。本手册中的数据只是在出版时有效的数据，在购买时要重新确认。
2. 所有盘管接口的位置是大约的，不应使用此尺寸来预接管。

Notes:

1. Do not for construction. This brochure includes data current at the time of publication which should be reconfirmed at the time of purchase
2. All location dimensions for coil connections are approximate and should not be used for prefabrication of connecting piping.

 TYBN系列逆流闭式冷却塔工程参数表 >>>

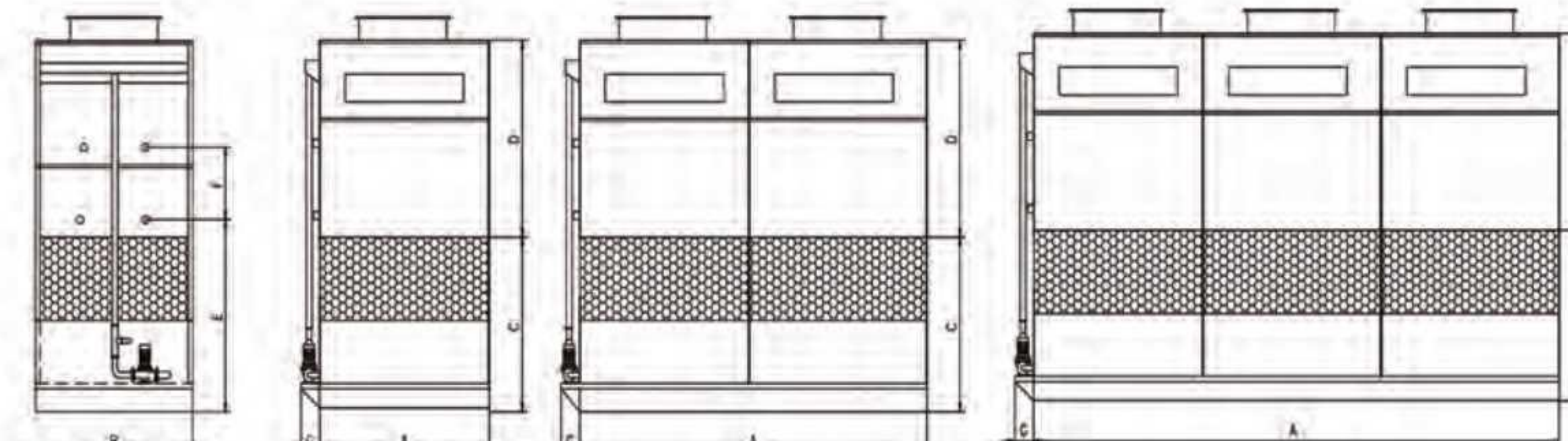
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TYB-30N	30	3	45000	0.75	28	DN80	2450	4150	1925	1840	3650
TYB-40N	40	4	65000	1.1	45	DN80	2670	4370	1925	1840	3650
TYB-60N	50	5.5	72000	1.5	65	DN80	3060	4760	1925	1840	3900
TYB-60N	60	7.5	87000	1.5	65	DN80	3820	5320	2470	1840	4100
TYB-70N	70	7.5	100000	2.2	100	DN100	5030	8380	2470	2380	4100
TYB-85N	85	2-4	2-65000	2.2	140	DN100	5600	8970	3770	1840	4310
TYB-100N	100	2-5.5	2-75000	2.2	140	DN100	6482	9869	3770	1840	4310
TYB-125N	125	2-5.5	2-75000	3	140	2-DN100	7670	11670	3770	2380	4510
TYB-150N	150	2-7.5	2-100000	3	140	2-DN100	8655	12555	3770	2980	4510
TYB-175N	175	3-5.5	3-75000	4	180	2-DN100	10580	15680	5610	2380	4550
TYB-200N	200	3-5.5	3-75000	4	180	2-DN100	11880	16980	5610	2380	4550
TYB-225N	225	2-11	2-125000	4	180	3-DN100	12850	19150	4846	2980	4630
TYB-250N	250	2-11	2-125000	5.5	233	4-DN100	14100	20800	6046	2980	4830
TYB-300N	300	2-15	2-160000	7.5	286	4-DN100	15550	23430	6046	3164	4830
TYB-350N	350	3-11	3-125000	7.5	286	5-DN100	18640	27200	7230	3164	4830
TYB-400N	400	3-15	3-16000	2-4	2-180	6-DN100	21740	32600	9030	3164	4970
TYB-450N	450	3-15	3-160000	2-4	2-180	6-DN125	23740	36340	9350	3164	4970
TYB-500N	500	3-18.5	3-200000	2-5.5	2-233	6-DN150	27240	47240	10150	3164	4970

注意:

1. 该数据不可用于制造。本手册中的数据只是在出版时有效的数据，在购买时要重新确认。
2. 所有盘管接口的位置是大约的，不应使用此尺寸来预接管。

Notes:

1. Do not for construction. This brochure includes data current at the time of publication which should be reconfirmed at the time of purchase
2. All location dimensions for coil connections are approximate and should not be used for prefabrication of connecting piping.



工程应用中的注意事项 Engineering considerations

位置要求 Location

闭式冷却塔必须在进风口处供给充足的新鲜空气。在设备的位置靠近墙壁或者位于密封空间时，必须采取相应措施以确保排出的高温、饱和气体不会发生转向而直接流进进风口。

Closed Circuit Cooling Towers must have an adequate supply of fresh air to all air inlets.

When units are located adjacent to building walls or in enclosures, Care must be taken to ensure that the warm, saturated discharge air is not deflected and drawn back to the air inlets.

考虑流体的兼容性 Think on compatibility of liquid(gas)

冷却塔所要冷却的流体必须与盘管材质有兼容性。与盘管材质不兼容的流体会导致盘管腐蚀和破坏。某些特定的流体可能要求对盘管内侧不定期的进行有压清洗或机械式清洗。在这种情况下，所提供的盘管必须在设计中考虑这方面的能力。

The fluid to be cooled must be compatible with the coil material. Fluids not compatible with coil materials can lead to corrosion and tube failure. Certain fluids may require occasional pressure cleaning or mechanical cleaning of the inside of coil tubes. In such cases the coil must be designed to provide this capability.

管路和阀门 Piping and Valves

管道的尺寸和安装必须符合良好的管道设计规范。所有的管道必须采用管道吊架或者其他支撑装置进行支撑，不得采用冷却塔体进行支撑。如果系统设计中有必要将各个冷却塔单元相互隔离时，也可考虑采用外部截止阀。

Piping must be sized and installed in accordance with good piping practice. All piping should be supported by pipe hangers or other supports, not by the cooling tower. External shut off valves may also be required if the system design necessitates the isolation of individual tower cells.

容量控制 Capacity Control

大多数的闭式冷却塔在平常的运行季节中随环境湿球温度工况的变化而变化，所以由于环境温度变化而引起的流体温度的偏差时就需要采用容量控制。

风机的周期性运行是容量控制的最简单方式，多应用于多风机或多单元设备的系统。在出水温度控制要求不高的场合，风机周期性运行将可以满足温度控制的需要而且简单易行。使用双速风机可以增加能量控制的档位数，与简单的风机周期性运行方式相比，这种方案对于节能更有效。

In general season, the performance of most closed circuit cooling tower will vary due to the change of its environmental wet bulb temperature. Therefore, when the change of environmental temperature leads to the difference of liquid temperature, in this case, capacity control will be required. Fan cycling is the simplest method of capacity control for our closed circuit cooling towers, normally used in multi fan unit system or multi cell unit system. In some circumstances of low requirement on outlet water temperature control, fan periodicity operation can meet with temperature control, also, easily and. Using two-speed fan can provide substantial energy savings when compared to simple fan cycling.

注意：周期性的频繁开停，会导致风机电机过热，建议每小时的开停次数不能超过6次。

Warning: Rapid on-off cycling can lead to the fan motor to overheat. It is suggested that controls be set to allow a maximum of on-off cycles per hour.

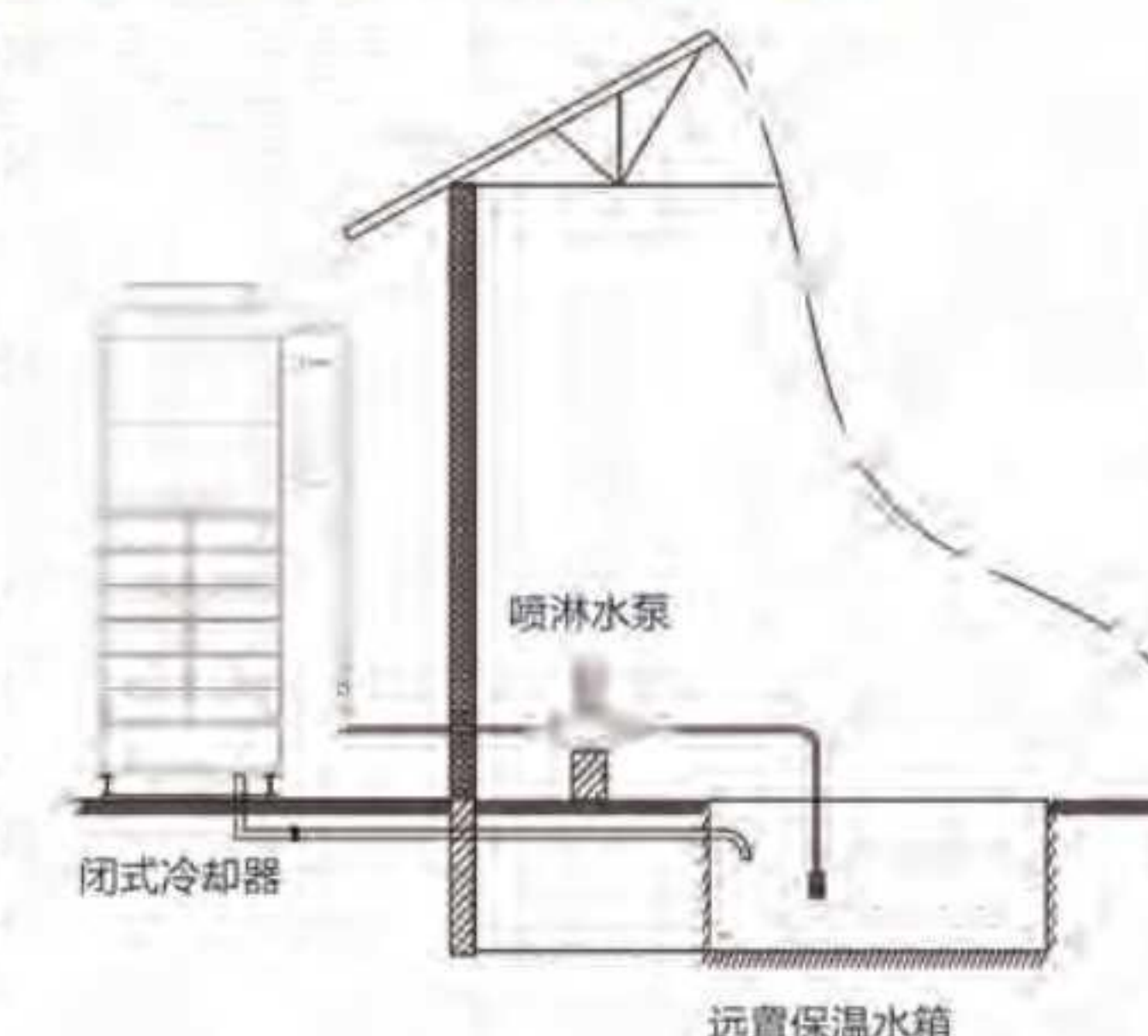
闭式冷却塔的防冻（特别重要）

How to prevent the cooling towers to be freeze (very important)

集水盘喷淋水的防冻 Protection Against Basin Water Freezing

当温度低于冰点，冷却设备在停机情况下，水池内的水就必须采取防冻措施。应该提供进一步的结冰防护，将集水盘中的水排至室内的辅助水箱，或者通过浸没式电加热器、蒸汽加热盘管或热水盘管束来为配水盘中的水提供辅助加热。

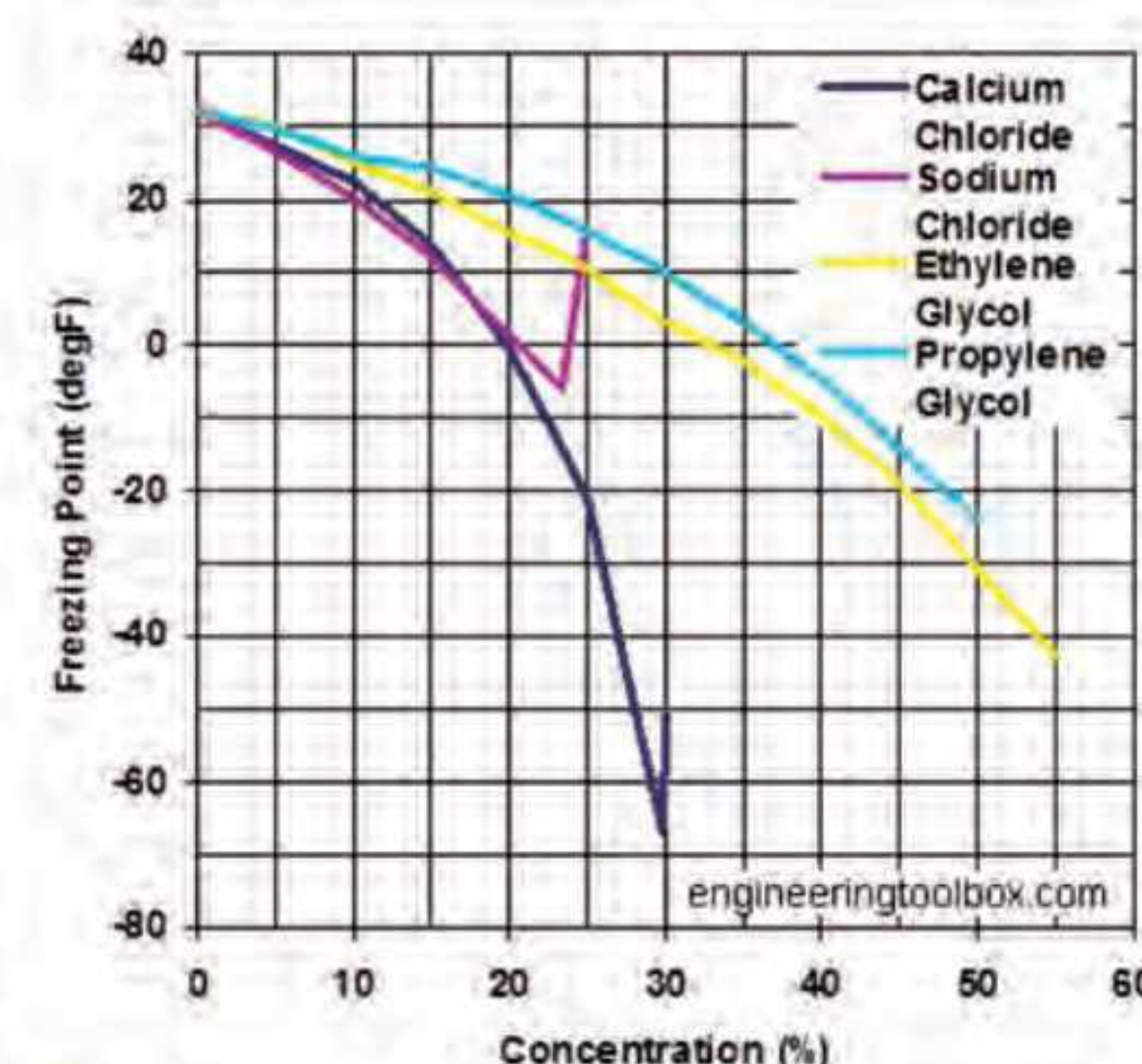
When the tower is shut down in freezing weather, the basin water must be protected further by draining to an indoor auxiliary remote basin tank or by providing supplementary heat to the basin water by means of electric immersion heaters, steam coils or hot water coils.



对于盘管的防冻 Protection Against Coil Freezing

当环境温度低于冰点时，即使循环水泵和风机不运行，工业流体设备也将有热量损失。在循环流体没有热负荷的情况下，及时在全流量下也会发生盘管结冰现象。为了避免这种可能的结冰问题，可供选用的保护措施是很易于采用的。在系统允许的情况下，对于盘管结冰的最佳保护措施就是采用防冻液，在无法采用防冻液时，系统可以设计成能够满足以下条件的形式：在循环流体中保持一定的热负荷，以保证流出盘管的流体温度不得低于7°C。

如不使用防冻液，可在盘管进出口设置放气阀和排水阀，冬季停机时手动放空管内介质。



At below freezing ambient conditions, the closed circuit cooling tower can experience heat loss even without the recirculating spray water pump and fans in operation. Without a heat load on the circulating fluid, Coil freezing can occur even at full flow. Protective means are readily available to avoid potential freeze problems. Where the system will permit, the best protection against coil freeze-up is the use of an anti-freeze solution. When this is not possible, the system must be designed to meet the following conditions: Maintain a heat load on the circulating fluid so that the temperature of the fluid leaving the coil will not fall below 7°C.

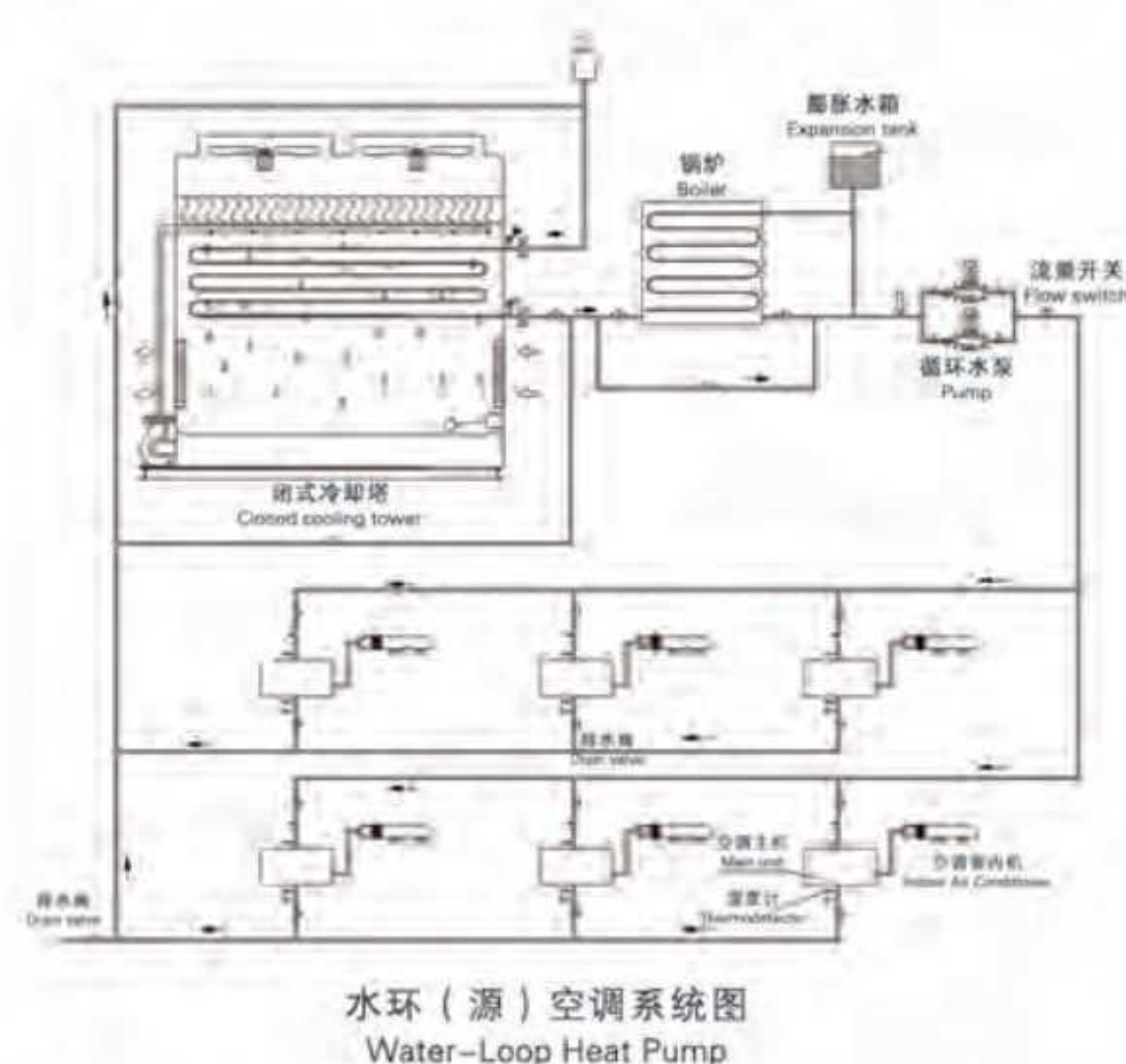
应用领域 Applications Fields

中央空调行业

Towers in Central Air Conditioning

中央空调行业中水环热泵系统以及作为地源热泵系统的辅助应用广泛，右图是水环空调使用的实例。

In central air conditioning field, closed circuit cooling towers are widely used in water-source heat pump system and ground source heat pump system. Please see the following example in water-source heat pump application.

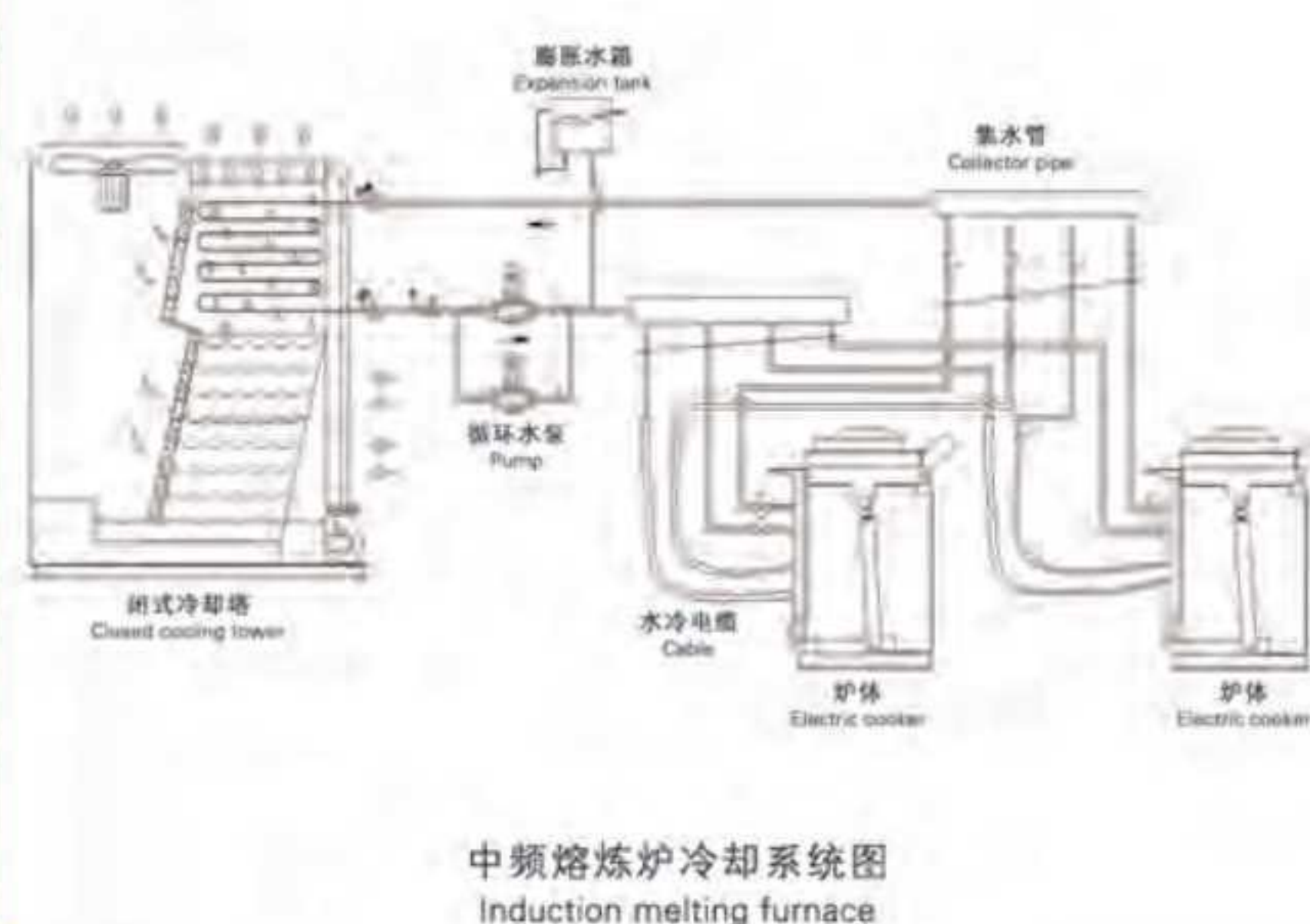


热处理行业

Closed Circuit Cooling Towers in Heat Treatment Industry

热处理行业中的感应熔炼炉，透热炉以及各种真空炉工作中会产生废热，设备的一些部件需要通冷却水，保护设备正常运行。

In heat treatment industry, induction furnace, diathermancy furnace and vacuum furnace will produce heat. In this case, some components of these equipment need water cooling, in order to protect these devices operate well.

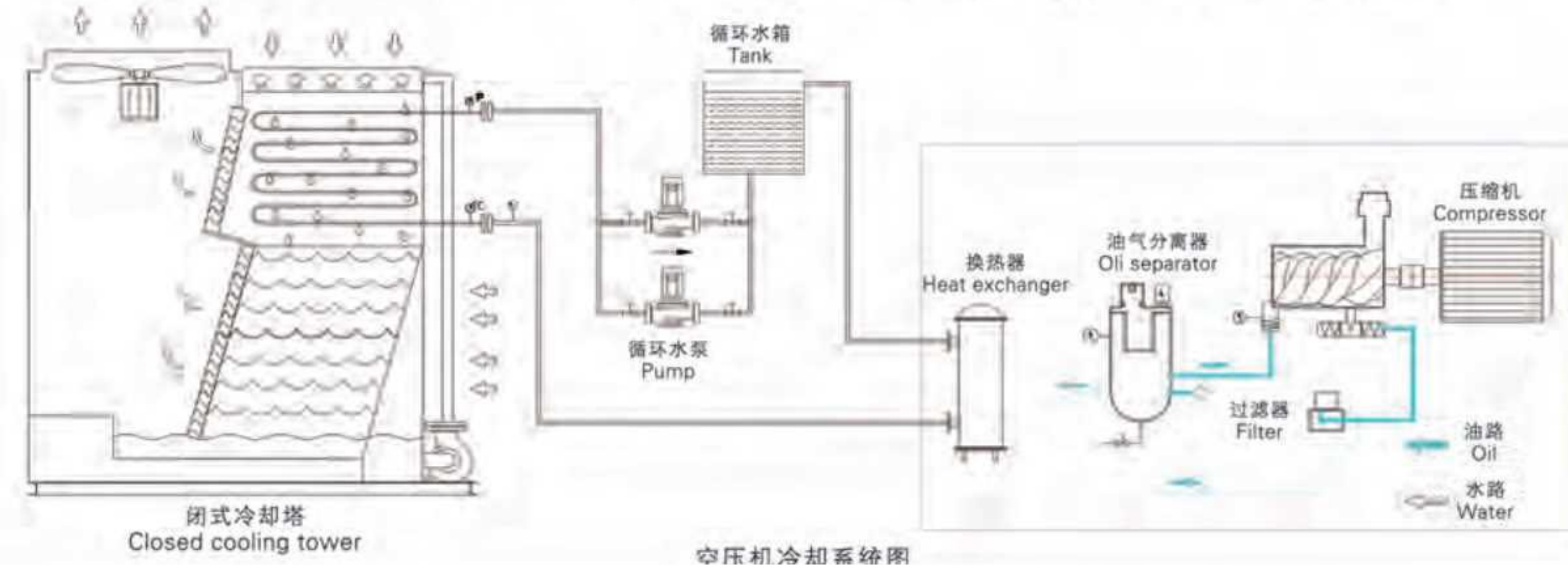


空压机冷却系统

Water cooling system in air compressor

工业生产中高速运转的设备都会发热，这些废热需要及时排掉，以防止设备高温损坏，比如空压机，发动机等。下图为一空压机冷却水冷系统的实例。

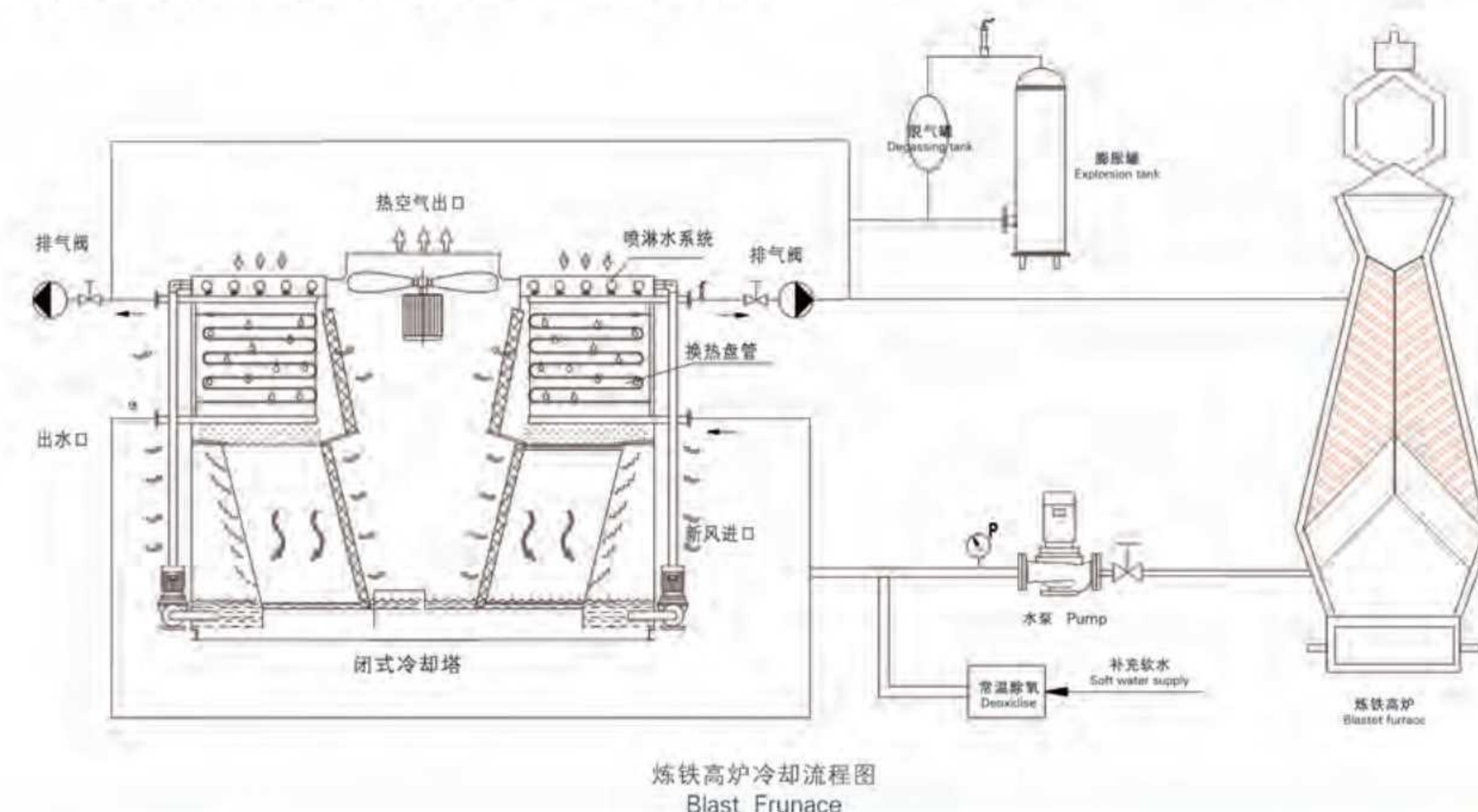
In industry, most of devices will bring heat which need eject in time, in order to avoid these equipments break down by high temperature, such as air compressor, motor. This example shows water cooling system in air compressor.



冶金行业 Towers in Metallurgy Industry

冶金行业中需冷却的设备的安全性及其重要，故对循环水的水质要求极高，如炼铁中的高炉循环水，连铸中的结晶器，电炉中的氧枪炉盖等需要安全性极高的冷却水。下图为一炼铁高炉冷却水应用实例

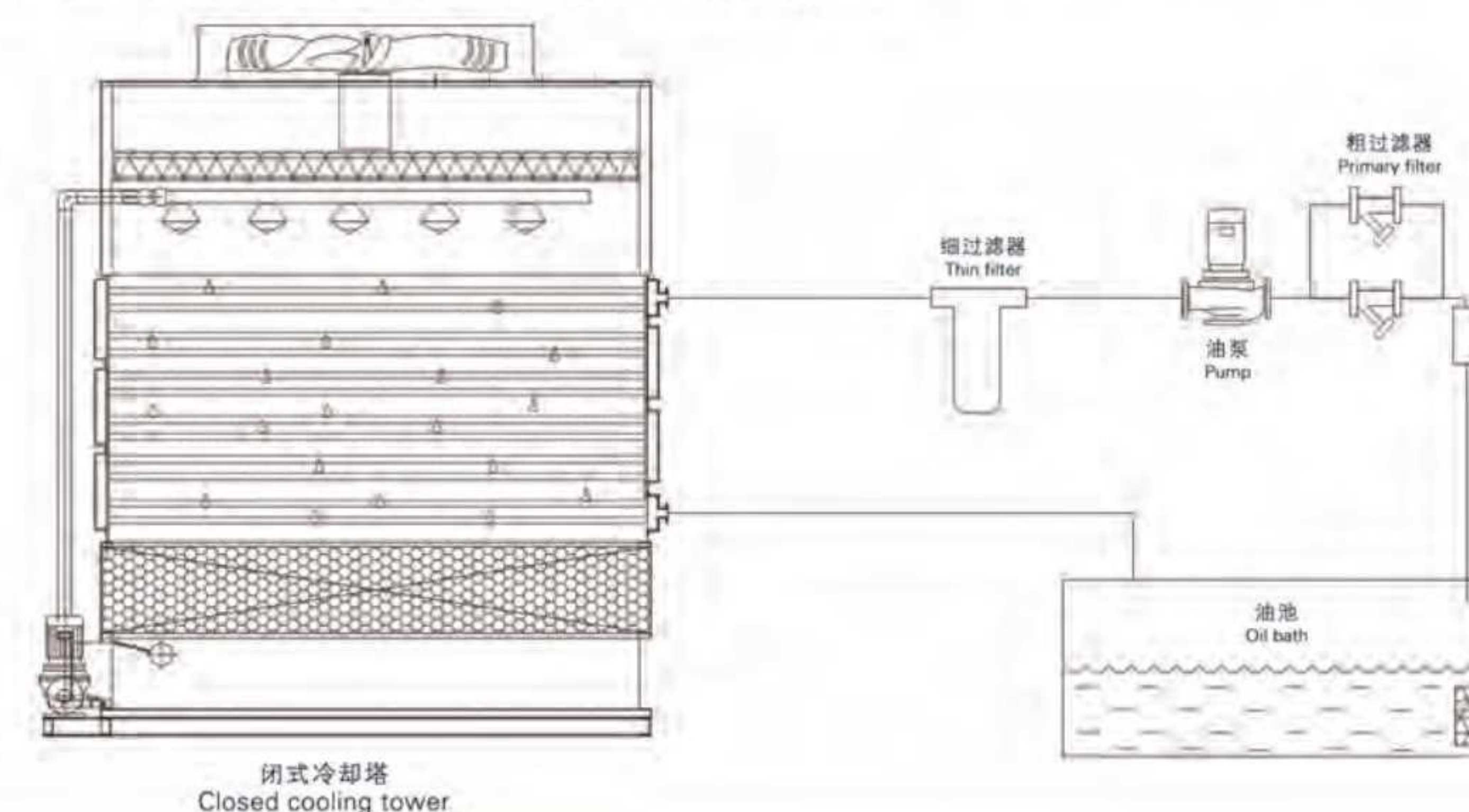
In metallurgy industry, it is very important for the safety of devices that need to be cooled. Therefore, the requirement for water quality of circulating water is extremely high. For example, the circulating water of blast furnace in steel-making, the circulating water of mold in continuous casting, the circulating water of furnace cover of oxygen lance in steel-making furnace etc. The following example shows water cooling system in blast furnace



特殊行业 Special Industry

一些行业中特殊流体的冷却，因为流体不能与外界接触，如淬火油，污水，乳化液等，需要用完全封闭式冷却方式，换热管一般为管箱式，以方便维修。下图为一淬火油冷却实例

In some special industry, liquid can not touch with outside environment, such as quenching oil, sewage, emulsified liquid etc which need totally closed circuit cooling manner and heat exchanger coils are normally header tube bundle type that for easy maintenance. Please see the following example in quenching oil cooling.



空冷器特点及应用领域 Structural feature & application realm of air cooled heat exchanger

空气冷却器是以环境空气作为冷却介质，横掠翅片管外使管内高温工艺流体得到冷却或冷凝的设备，简称“空冷器”，也称“空冷式热交换器”。

空冷器由翅片管束、风机、百叶窗、构架、检修平台和其它用户要求的部件构成。

空冷器运行时，被冷却的物料走管内，环境空气在风机的作用下走管外，利用两者之间的温差来冷却。采用空冷器代替水冷器进行介质的冷却或冷凝的优势在于，不仅节约了宝贵的水资源，还可以减少水污染。此外还具有维护费用低、运转安全可靠、使用寿命长等优点。特别是在我国北方和西部地区，空冷器较其他换热设备有很大成本和环保的优势。空冷器可广泛应用于石化、化工、医药、煤炭、电力、冶金等领域。

Air cooler in ambient air as cooling medium, the horizontal sweep outside fin tube inside the high temperature process fluid get cooling or cooling equipment, hereinafter referred to as "air cooler", also known as "air cooled heat exchanger".

Air cooler of finned tube bundle, fan, louver, architecture and maintenance platform and other user's components.

Operation of the air cooler, materials are cooled tube, under the action of ambient air in fan go tube, the temperature difference between the two is used to cool. Using air cooler instead of the water cooler for medium cooling or cooling condenser has the advantage that not only save precious water resources, can also reduce water pollution. In addition also has a low maintenance cost, safe and reliable operation, long service life, etc. Especially in northern and western areas in China, air cooler than other heat exchange equipment has the advantage of large cost and environmental protection. Air cooler can be widely used in petrochemical, chemical, pharmaceutical, coal, electric power, metallurgy, etc.



空冷器结构形式 Structural type of air cooled heat exchanger

引风式 induced draft

翅片管束位于风机、风筒的下侧，因为风筒对于翅片管束有很好的防尘、防雨雪、防爆晒的作用，故而引风式空冷器具有相对稳定的换热性能。同时它还具有如下优点：风量分配均匀、热循环少、噪音低、使用寿命长等特点。

The finned tube bundle is under the wind machine and wind roll, because the wind roll can keep the finned tube bundle from dust, rain, snow and isolation, so the induced draft air cooler is relatively stable in terms of heat exchange. Meanwhile, it has such advantageous features as equally distributed air volume, less heated air circulation, low noise, and long duration, etc.



引风式 Induced draft

鼓风式 forced draft

翅片管束位于风机、风筒的上侧，风机电机位于空冷器的底部，维修十分方便。并且，风机电机的环境温度比较低，大大延长了电机的使用寿命。

The finned tube bundle is on the top of the wind machine and wind roll, and the wind machine and electrical machine are at the bottom of the air cooler, which facilitates. Besides, the lower temperature around the wind machine and electrical machine prolongs the duration of the electrical machine.

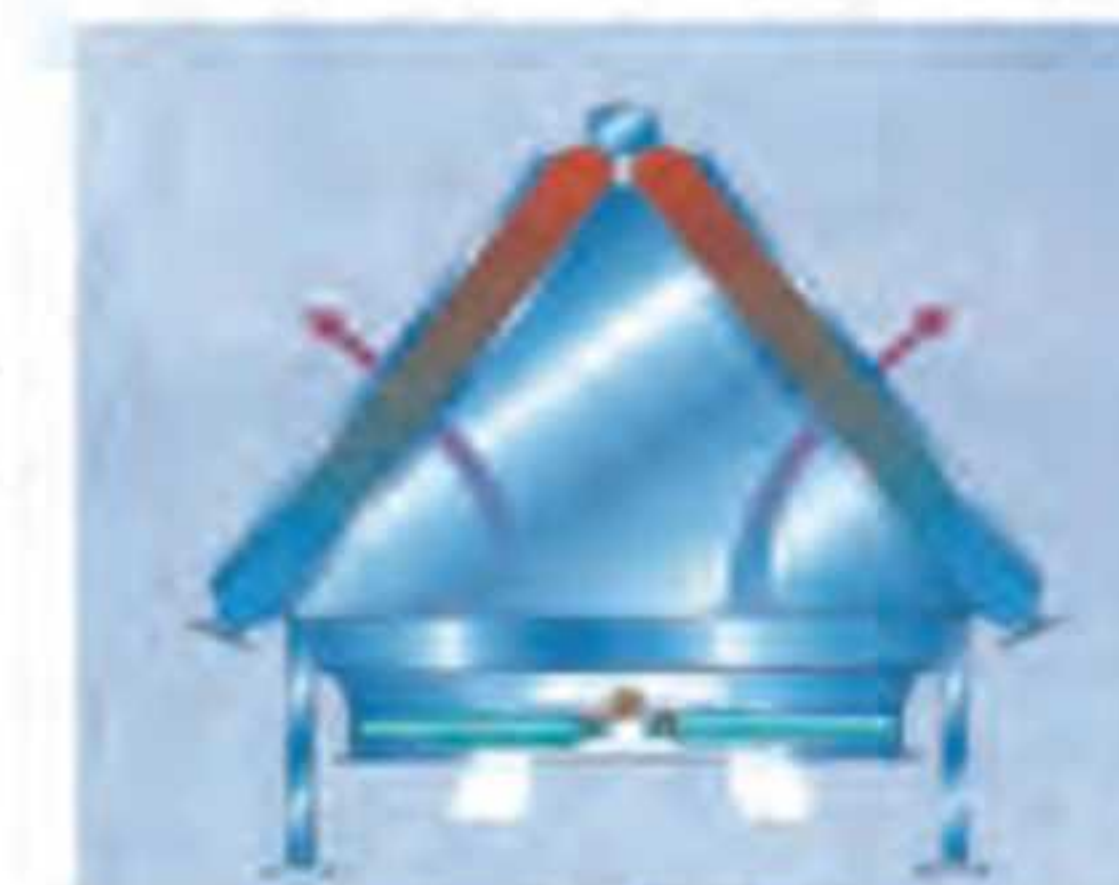


鼓风式 Forced draft

斜顶式 pentroof

翅片管束60°斜置于构架顶部，占地面积相对较小，适合于物料的冷凝，管内阻力降和传热系数要比水平式空冷器优良。

The finned tube bundle, set slanting on the top of the framework with the angle of 60°, covers a smaller area. With higher resistance drop and heat transfer coefficient than those of the horizontal air cooler, it fits for condensation of materials.

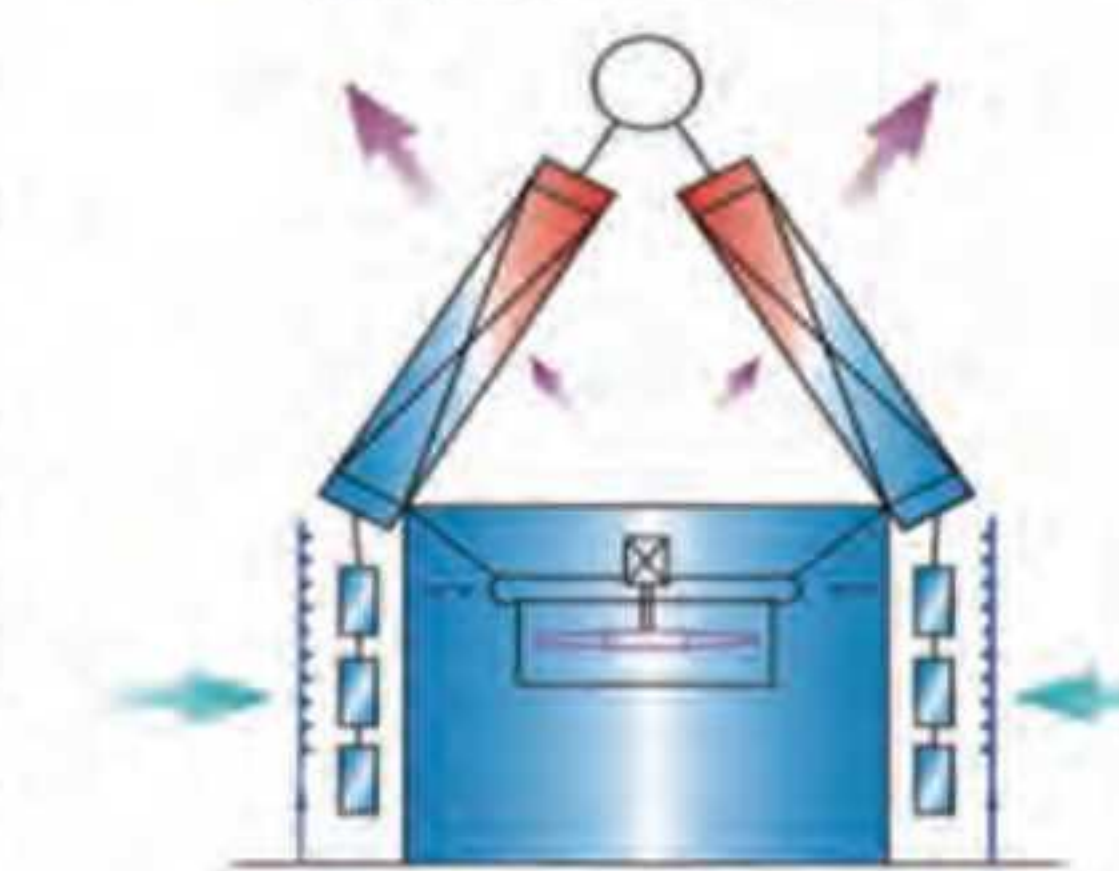


斜顶式 Pentroof

联合式空冷器 integrative air cooler

翅片管束（一段）60°斜置于构架顶部，占地面积相对较小；翅片管束（二段）布置于风机进风口两侧，并且在翅片管束（二段）的迎风侧，布置了增湿喷水系统。在极高环境温度条件下，增湿喷水系统将大幅度提高设备的排热能力，使空冷器轻松过夏。

One finned tube bundle, set slanting on the top of the framework with the angle of 60°, covers a smaller area. Two finned tube bundles are set at two sides of the air inlet, and the water spraying system is installed at the windward side of the tube bundles. Under the condition of extremely high temperature, the water spraying system will greatly enhance the thermal discharge of the equipment, making it sustain the hot summer.



联合型空冷器
Integrative air cooler

翅片管结构形式 Structural type of finned tube



翅片管是空气冷却器的主要热交换元件，其结构形式直接决定了整个换热器的性能。同时，翅片与基管的连接方式也对热传递有很大的影响，用于钢管、不锈钢管上的翅片主要由铝片、钢片或热镀锌钢片制成。

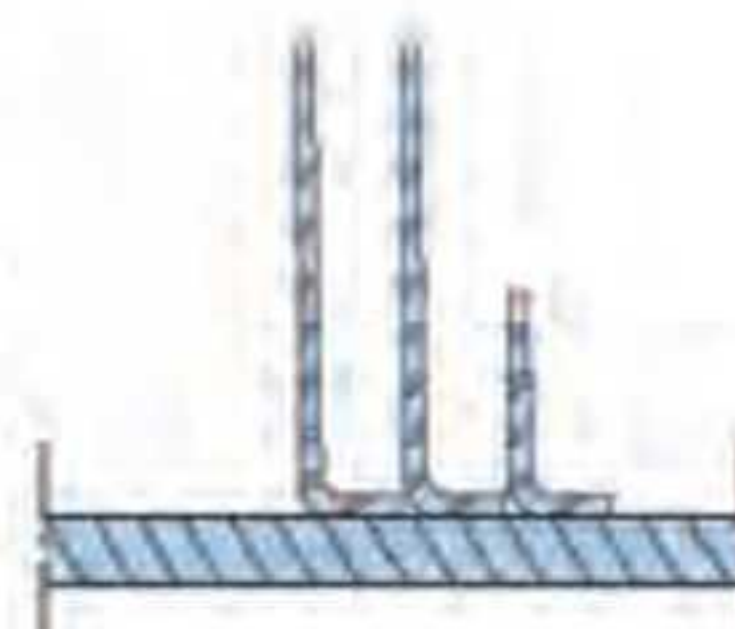
Finned tube is the main heat exchange element of air cooler, its structure directly determines the whole performance of the heat exchanger. At the same time, the fin and tube connection also has great influence on heat transfer, applied to steel tube, stainless steel pipe fin is mainly made from aluminium, steel or hot dip galvanized sheet steel.

高效换热翅片管 High-efficiency heat exchange finned tube

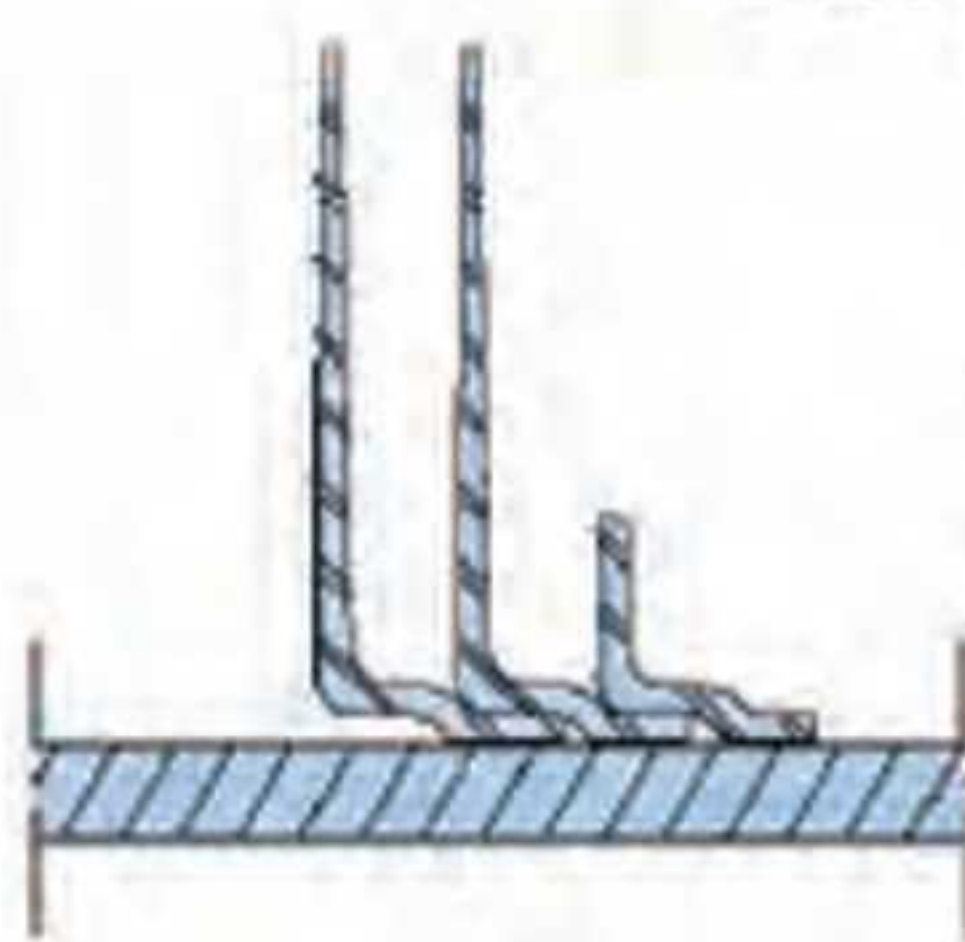
● L型绕片管 L around the tube

适用于温度较低的工况，预制成L形的铝带螺旋缠绕在换热基管上，采用这种工艺的铝带和基管的接触面积较大，热量从基管表面传递到翅片上，较大的接触面积提高了热交换效率。造价较低，适用温度不超过150℃的系统。

Suitable for low temperature condition, prefabricated into L aluminum with spiral wound in heat exchange tube, using the technology of aluminium strip and tube of the contact area is larger, the heat from the base surface is passed on to the finned tube, the larger contact area to improve the efficiency of heat exchange. Low cost, applicable temperature does not exceed 150 °C.



● L型绕片管 L around the tube



铝带经过绕制，在基管的根部形成双L形状，这种翅片管翅片根部互相重叠，与管壁接触更好，保证了对管壁的完全覆盖，抗腐蚀能力提高，适用温度可在200℃以内，也可适用于湿式空冷器；但加工难度和价格也相应较高。

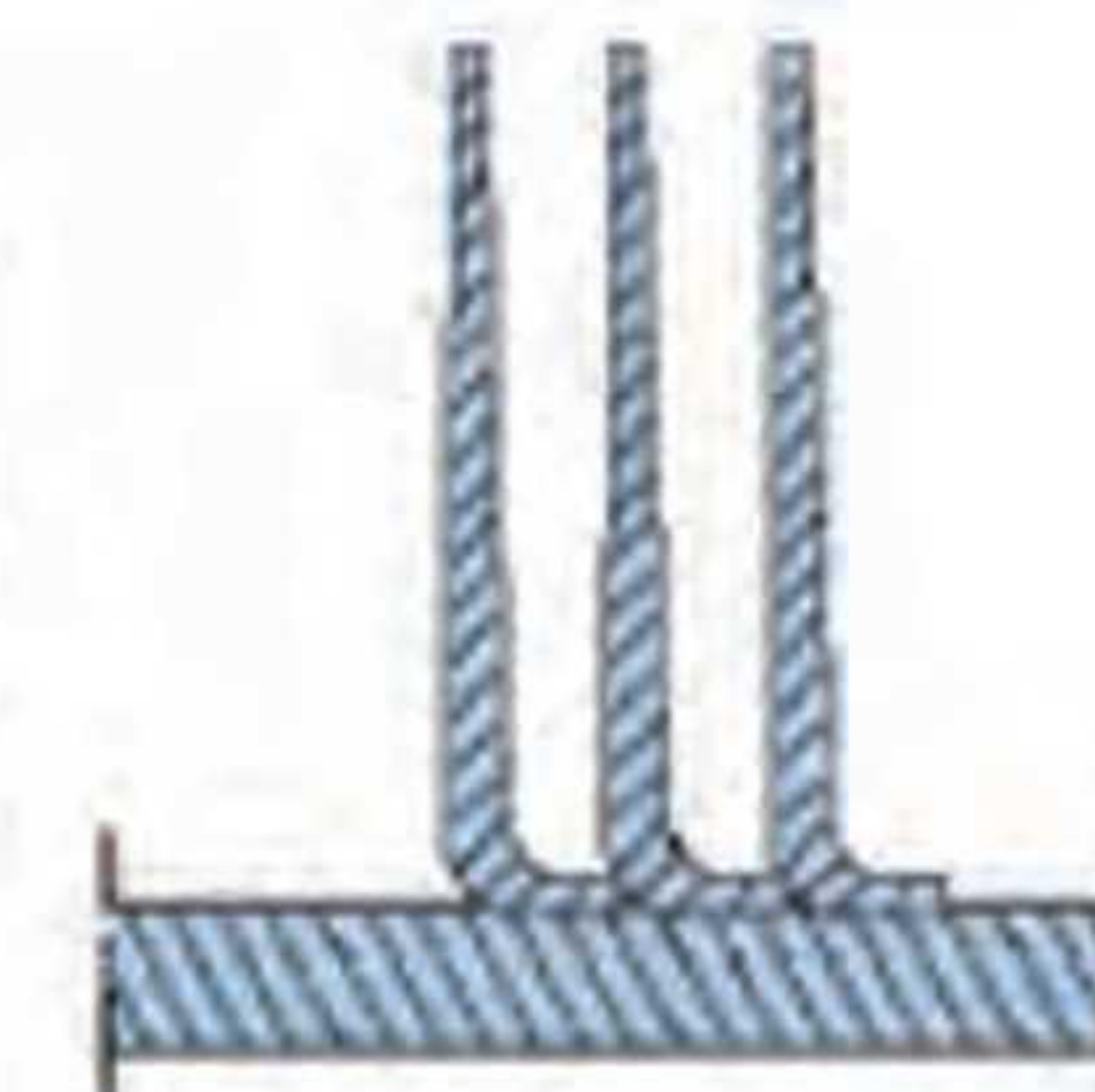
Aluminium strip through the winding, in the base tube forming double L shape, the finned tube fin root overlap each other, better contact with the wall, to ensure the full coverage of the wall, corrosion resistance, applicable temperature within 200 °C, also can be applied to wet air cooler; But the processing difficulty and the price is higher accordingly.

高效换热翅片管 High-efficiency heat exchange finned tube

● KL型滚花翅片管 KL knurling type finned tube

它是L形绕片管的改进，制造时，基管表面先经滚花，绕片时再在L根部的上面同步滚压一次，使L根部一部分面积嵌入基管表面，这样换热效率和防腐蚀能力更高，使用温度可达250℃。

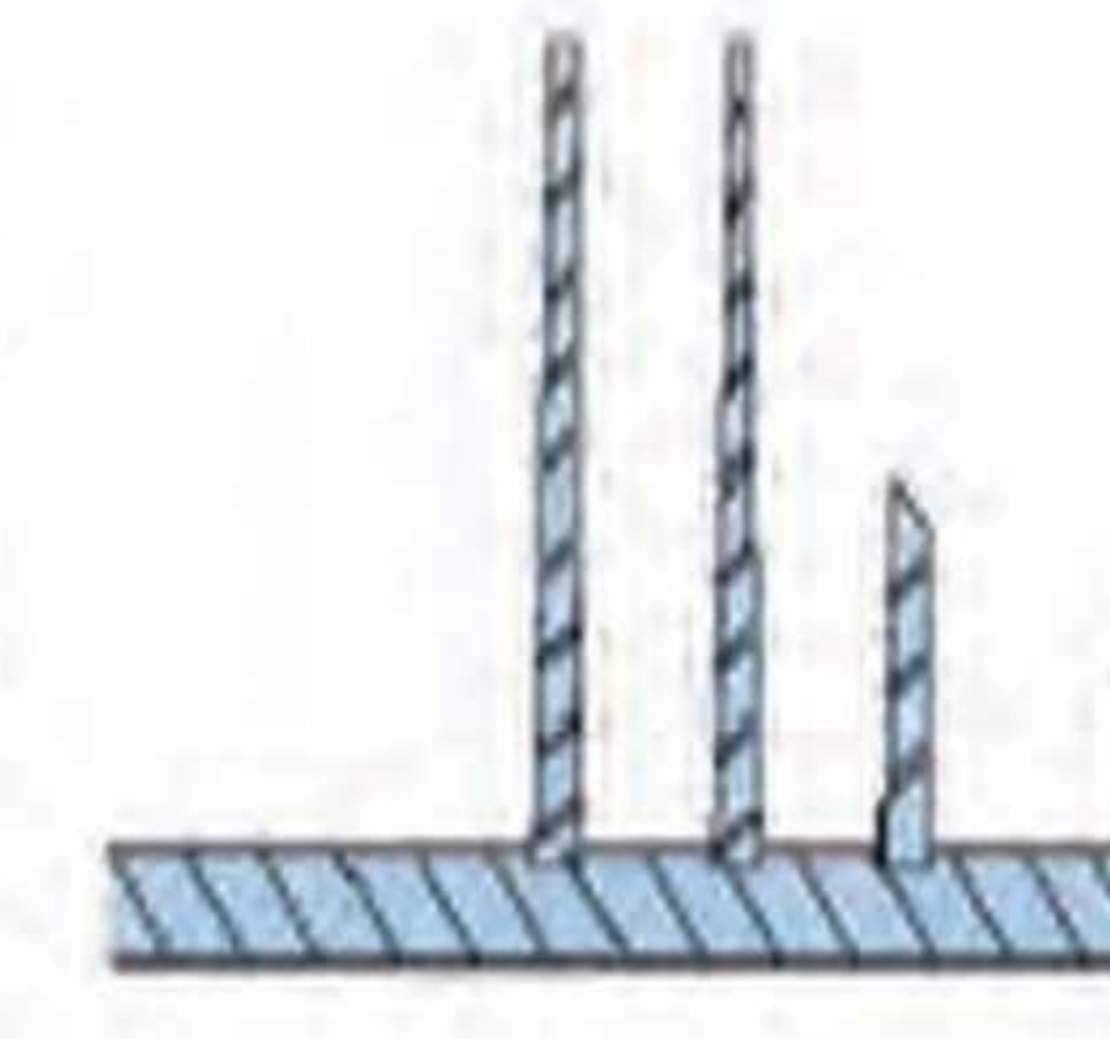
It is round tube L improvement, manufacturing, the surface of base tube by knurling, around for a little while longer on L the roots of synchronous rolling, make L root part of the area of embedded pipe surface, so in higher heat efficiency and anti-corrosion ability, using temperature is 250 °C.



● G型镶嵌式翅片管 G Mosaic type finned tube

采用在基管表面预先制成等距的槽，安装翅片，然后轧制槽的边缘的工艺，使翅片和基管之间形成牢固的连接，传热效率高，且高温和外力对这种翅片管几乎没有影响，但其缺点是不耐腐蚀，造价较低。

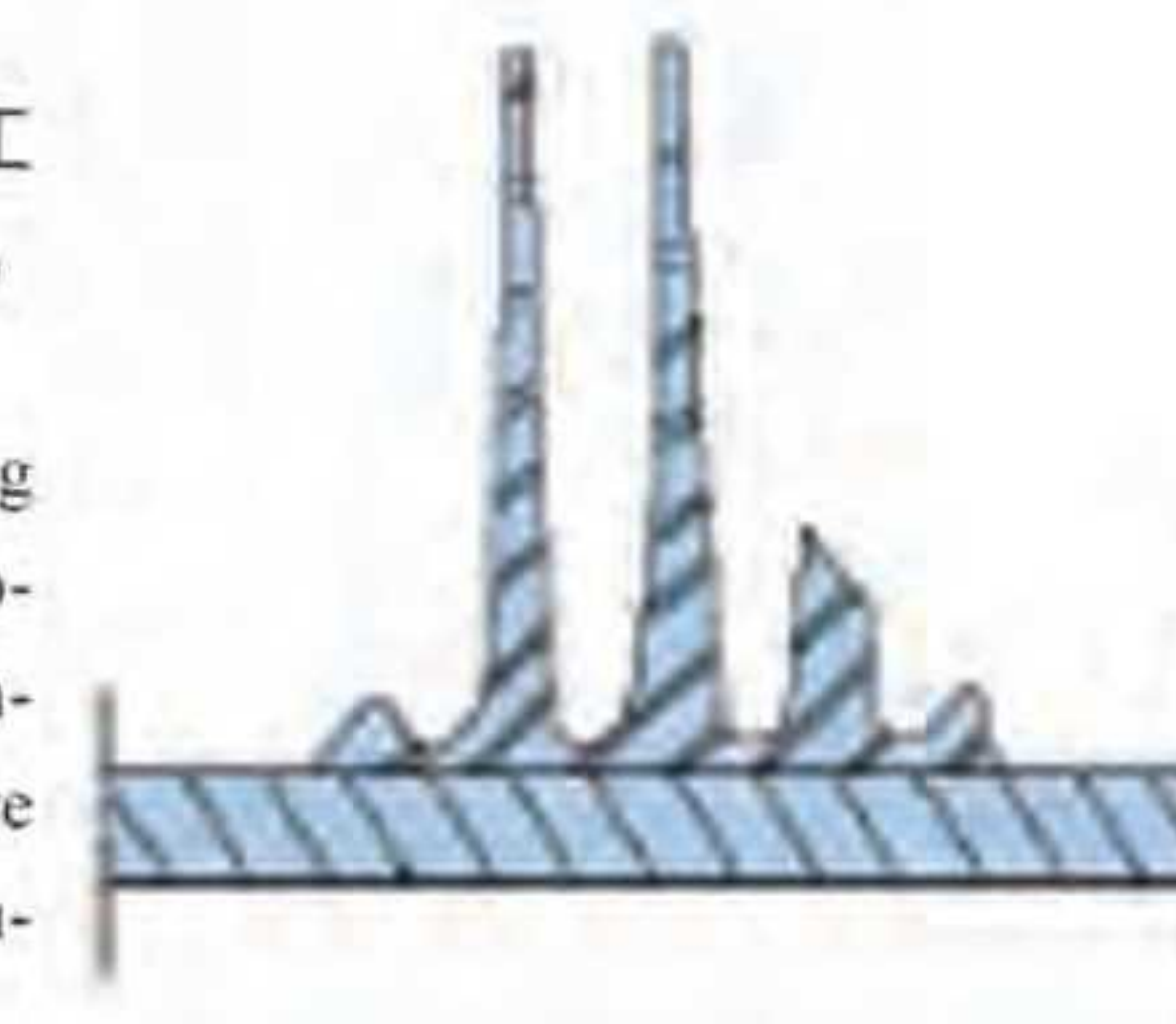
Made equidistant slot in the base tube surface in advance, installation of fin, then rolling groove on the edge of the craft, make form a strong connection between fin and tube, high heat transfer efficiency, and high temperature and external force has no effect on the finned tube almost, but its drawback is not resistant to corrosion, low cost.



● DR型翅片管 DR type finned tube

是铝管套在基管上，经过机械轧制紧箍在管子上，这种制造工艺使翅片管抗腐蚀性能好，传热效率高，翅片的整体性和刚度高，易于蒸汽和高压水的清洗，但设备造价高，耗铝材增多。

It is aluminum tube set in the pipe, through mechanical rolling hoops on the pipe, the manufacturing process to make finned tube corrosion resistant performance is good, high heat transfer efficiency, the integrity of the fin and rigidity is high, easy to steam and high pressure water cleaning, but high equipment cost, increased consumption of aluminum.



空冷器型号的说明

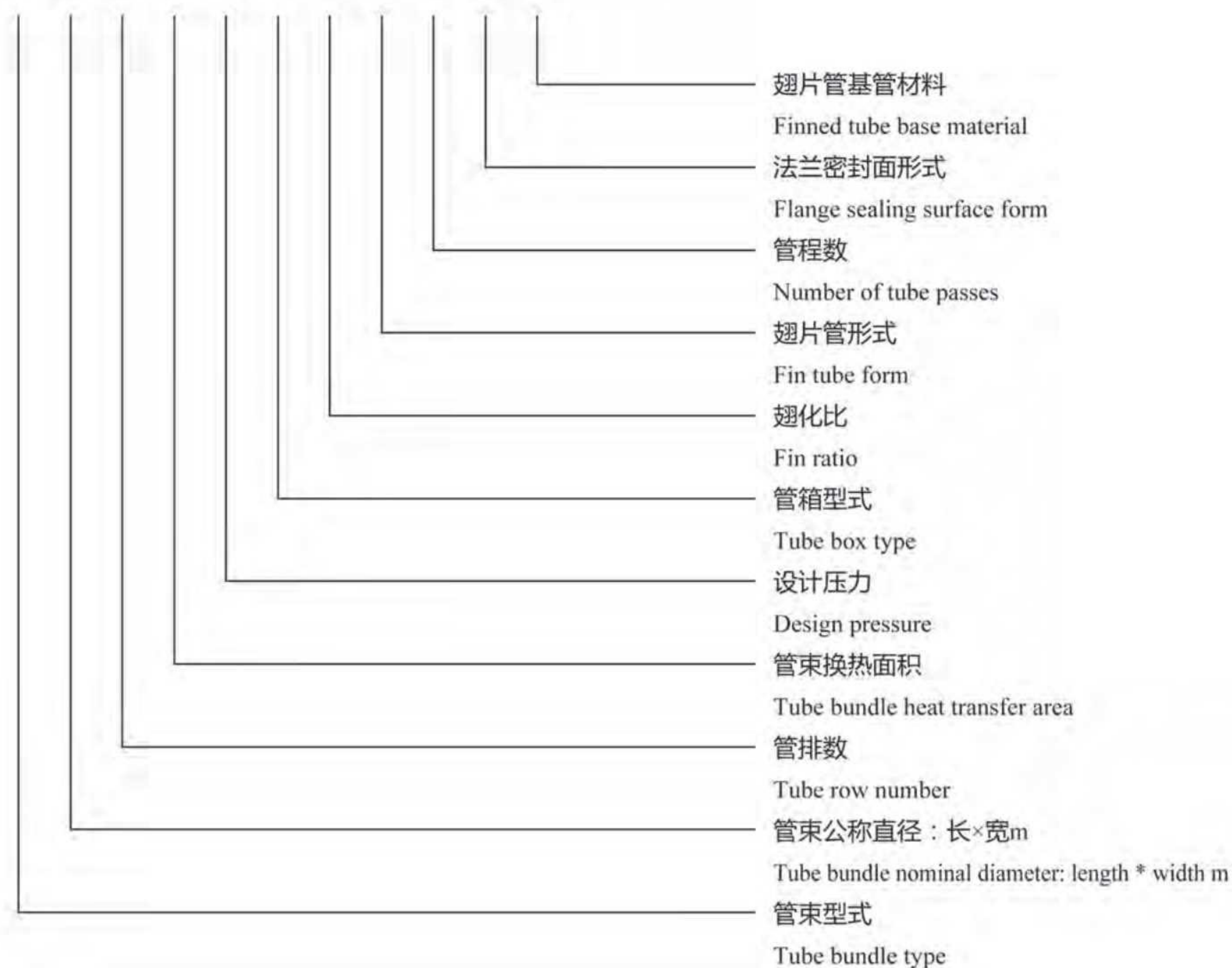
为方便用户, 我公司空冷器型号均参照NBT 47007-2010《空冷式热交换器》编制。

For the convenience of users, our company air cooler models are referenced to 47007-2010 NBT "air cooled heat exchanger" preparation.

管束 Bundle

管束型号的表示方法:

Bundle model representation method



 高效换热翅片管
High-efficiency heat exchange finned tube

管束型式与代号见表

Tube bundle type and code table

管束型式 Tube bundle type	代号 Code	管箱型式 Tube box type	代号 Code	接管法兰密封面型式 Flange sealing surface	代号 Code	翅片管型式 Fin tube type	代号 Code
鼓风式水平管束 Blast horizontal tube bundle	GP	丝堵式管束 Plug type tube	S	突面法兰 Face flange	RF	L型翅片管 L type finned tube	L
斜顶管束 Inclined top tube bundle	X	可卸盖板式管箱 Detachable cover plate type pipe box	K1	凸(凹)面法兰 Convex (concave) face flange	M (FM)	双L型翅片管 Double L type finned tube	LL
引风式水平管束 Air draught type horizontal tube bundle	YP	可卸帽盖式管箱 Detachable cap type tube box	K2	榫(槽)面法兰 Tenon (groove) flange	T (G)	滚花型翅片管 Rolling fin tube	KL
湿式立置管束 Wet standing tube bundle	SL	集管式管箱 Collecting pipe box	J	环连接面法兰 Ring flange	RJ	双金属轧制翅片管 Double metal rolling fin tube	DR
干—湿联合斜置管束 Dry and wet combined inclined tube bundle	SX			透镜垫法兰 Lens gasket flange	TJ	镶嵌型翅片管 Inlaid fin tube	G

翅片管基管材料:当选用碳钢时可缺省,当选用抗H₂S、Cl⁻腐蚀稀土合金材料09Cr2AlMoRE时标注D, 12Cr2AlMoV时标注R, 选用其它材料也应标注。

Fin tube material base tube: when carbon steel can default, when selection H2S, Cl- anti corrosion of rare earth alloys 09Cr2AlMoRE marked D, 12Cr2AlMoV marked R, use other materials should also be marked.

标注示例：

Annotation sample:

鼓风式水平管束：长9m、宽2m；6排管；基管换热面积140m²；设计压力4Mpa；可卸盖板式管箱；双金属轧制翅片管，翅化比23.4；VI管程；接管法兰密封面凹凸面；材料09Cr2AlMoRE，管束型号为：GP9×2-6-140-4.0K1-23.4/DR-VIMFMD。

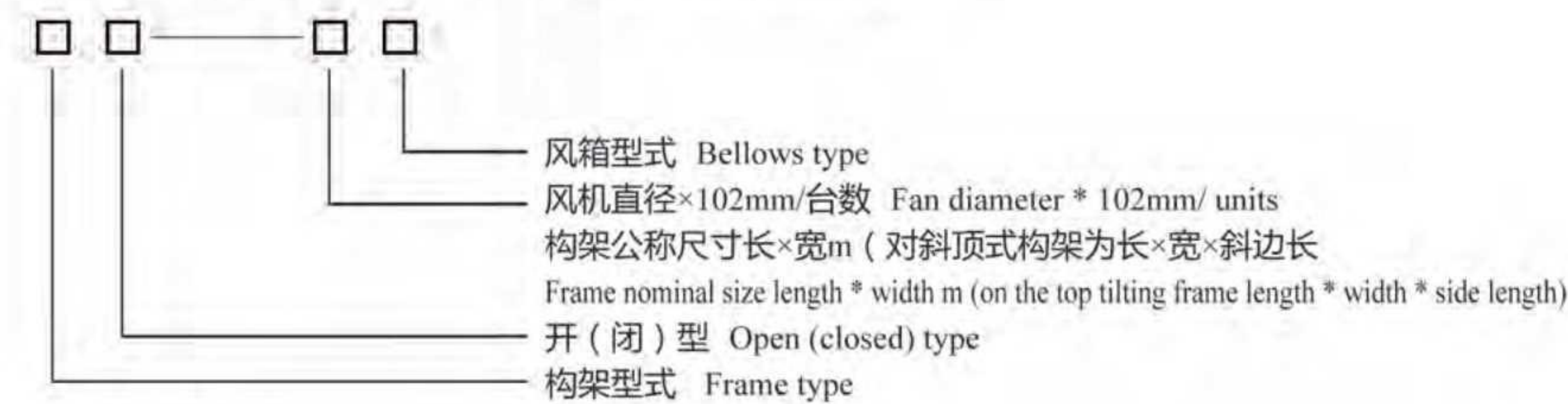
Blast type horizontal tube: length 9m, width 2m; 6 row tube; tube heat transfer area 140m²; 4Mpa design pressure; detachable cover plate tube box; bimetallic rolled finned tube, fin ratio 23.4; VI tube; pipe flange sealing surface concave convex; material 09Cr2AlMoRE, tube type: GP9 * 2-6-140-4.0K1-23.4/DR-VIMFMD.

引风式水平管束：长9m、宽3m；6排管；基管换热面积193m²；设计压力2.5Mpa；丝堵式管箱；L型翅片管，翅化比23.4；II 管程；接管法兰密封面环连接面；材料为碳钢的管束型号为：YP9×3-6-193-2.5S-23.4/L-II RJ。

Fan type: horizontal tube length 9m, width 3M; 6 row tube; tube heat transfer area 193m²; 2.5Mpa design pressure; plug pipe box; L type finned tube, fin ratio 23.4; II tube; pipe flange sealing surface ring joint face; material: YP9 steel tube type * 3-6-193-2.5S-23.4 /L- II RJ.



● 构架型号表示方法:
Framework model representation method



标注示例:
Annotation sample

鼓风机式空冷器水平构架长9m、宽4m；风机直径3000mm，2台，方箱型风箱；闭式构架型号为：GJP9×4B-30/2F.

blast type air cooler horizontal frame length 9m, width 4m; fan diameter 3000mm, 2 Taiwan, square box type bel-lows; closed frame type: GJP9 * 4B-30/2F.

型式与代号
Type and code

构架型式 Frame type	代号 Code	构架开 (闭) 型式 Frame open (closed) type	代号 Code	风箱型号 Bellows type	代号 Code
鼓风机式水平构架 Blast level frame	GJP	开式构架 Open frame	K	方箱型 Square box type	F
斜顶构架 Inclined roof truss	JX	闭式构架 Closed frame	B	过渡锥型 Transition cone type	Z
引风式水平构架 Air draught type horizontal frame	YJP			斜坡型 Ramp type	P
湿式构架 Wet frame	JS				
干-湿联合构架 Dry and wet combined structure	JL				



● 风机型号表示方法:
Fan model representation method



标注示例:
Annotation sample

a、鼓风机式，停机手动调角风机；直径2400mm、B型玻璃钢叶片；叶片数4个；悬挂式电动机轴朝上V带传动、电动机功率18.5KW的风机型号：G-TF24B4-Vs18.5.

a、Blast type, manual angle adjustable fan; diameter B, 2400mm type glass steel blade; blade number 4; suspension type motor shaft upward V belt drive, motor power 18.5KW fan model: G-TF24B4-Vs18.5.

b、引风式，自动调角风机；直径3000mm、R型玻璃钢叶片；叶片数6个；悬挂式电动机轴朝上V带传动、电动机功率15KW的风机型号：Y-2FJ30R6-Vs15.

b、draft type, automatic angle angle fan; diameter 3000mm, R type glass steel blade; blade number 6; suspension type motor shaft upward V belt drive, motor power 15KW fan model: Y-2FJ30R6-Vs15.

型式与代号
Type and code

通风方式 Ventilation mode	代号 Code	风量调节方式 Air volume control mode	代号 Code	叶片型式 Blade type	代号 Code	风机传动方式 Fan drive mode	代号 Code
鼓风机式 Air blast type	G	停机手动调角风机 Stop Manual angle regulating fan	TF	R型玻璃钢叶片 R type glass fiber reinforced plastic blade	R	V带传动 V-belt drive	V
引风式 Draught type	Y	不停机手动调角风机 NO-Stop Manual angle regulating fan	BF	B型玻璃钢叶片 B type glass fiber reinforced plastic blade	B	电动机直接传动 Motor direct drive	Z
		自动调角风机 Automatic angle regulating fan	ZFJ	W型玻璃钢叶片 W type glass fiber reinforced plastic blade	W	悬挂式V带传动，电动机轴朝上 Hanging V belt drive, t he motor shaft up	Vs
		自动调速风机 Automatic speed regulating fan	ZFS	铸铝叶片 Cast aluminum blade	L	悬挂式V带传动，电动机轴朝下 Hanging type V belt drive, the motor shaft down	Vx

百叶窗 Shutters

百叶窗型号表示方法 shutter type representation method



标注示例: Label examples

手动调节百叶窗, 长9m, 宽3m, 其型号SC9×3
manual adjustment of the shutters, long 9m, width 3M, its model SC9 * 3

自动调节百叶窗, 长6m, 宽2m, 其型号ZC6×2
automatic adjustment of the shutters, long 6m, wide 2m, its model ZC6 * 2

喷淋装置 Spraying device

型式与代号 Type and code



标注示例: Label examples

喷淋装置长9m、宽3m, 其型号为P9×3
Spray device length 9m, width 3M, its model is P9 * 3

空冷器 Representation

空冷器型号的表示方法 Representation of air coolers types



标注示例: Label examples

a、鼓风机式空冷器 水平式管束, 长×宽为12m×3m, 4片, 停机手动调角风机, 直径3600mm, 6台, 水平构架。长×宽为12m×6m, 1跨开式构架, 手动调节百叶窗, 4台。长×宽为12m×3m的空冷器型号为:
GP12×3/4-TF36/5-GJP12×6B/1 GJP12×6K/1-SC12×3/4

a、Air cooler type: GP12×3/4-TF36/5-GJP12×6B/1 GJP12×6K/1-SC12×3/4
Forced draft air cooler parallel tube bundle, 12m(length)×3m(width), 4pieces; close-down manual angle modulation wind machine. 3600mm diameter. 6 sets; parallel framework. 12m(length)×6m(width), one closed one open; manual regulation blind, 12m(length)×3m(width), 4pieces.

b、引风式空冷器 水平式管束, 长×宽为12m×3m, 2片, 停机手动调角风机, 直径3600mm, 2台, 自动调速风机, 直径3600mm, 1台。水平构架, 长×宽为12m×6m。1跨闭式构架, 手动调节百叶窗, 2台, 长×宽12m×3m的空冷器型号为:

YP12×3/2-TF36/3-ZFS36/1-GJP12×6B/1-SC12×3/2
YP12×3/2-TF36/3-ZFS36/1-GJP12×6B/1-SC12×3/2

b、Air cooler type: YP12×3/2-TF36/3-ZFS36/1-GJP12×6B/1-SC12×3/2
Introduced draft air cooler parallel tube bundle. 12m(length)×3m(width), 2pieces; close-down manual angle modulation wind machine. 3600mm diameter, 2 sets; automatic speed-regulation wind machine. 3600 diameter, 1 set; parallel framework, 12m(length)×6m(width), one closed; manual-regulation blind, 12m(length)×3m(width), 2 p.

 合作企业名录
COOPERATION



蒸发式冷凝器优点及应用领域 The evaporative condenser advantage and application fields



蒸发式冷凝器应用实例 Applications in engineering

TYZH/TYZN系列蒸发式冷凝器产品广泛应用于能源化工、医药、煤炭、电力、工业制冷、啤酒、饮料、食品的低温加工、冷藏、建筑空调制冷等领域。

TYZH/TYZN series products are widely used in energy chemical industry, medicine and coal, electricity, industry refrigeration, beer, beverage, food processing, the coal storage, the low temperature of building air conditioning and refrigeration, etc.

● 食品工业 The food industry

- 家禽屠宰场 Poultry slaughter house
- 多用途冷库/冷却和冷冻系统 Multi-purpose cold storage/cooling and the refrigeration system
- 啤酒和饮料工业 Beer and beverage industry
- 工业制冰/溜冰场 Industrial ice/staking rink
- 冰淇淋厂 Ice cream factory
- 鱼类加工业 Fish processing industry

● 化工医药 Chemical medicine

- 甲醇/合成氨压缩机间冷却 Inter-cooling of methanol/methanol synthetic ammonia compressor
- 合成气冷却冷凝 Syngas cooling condensation
- 天然气或焦煤气转化工序气体冷却 Methanol distillation process cooling condensation
- 净化工序冷凝冷却 Gas cooling of natural gas or coke gas exchange process
- 尿素的尾气回收 Purification process as well as cooling condensation
- 汽轮机的蒸汽冷凝 Steam condensation of turbine
- 乙酸乙酯冷凝 Ethyl acetate condensation

蒸发式冷凝器的优点 The closed circuit cooling advantage

相对传统方式的冷凝器，蒸发式冷凝器具有以下几方面的优势：

Relative to the traditional way of condenser, the evaporative condenser has the following advantages:

● 节能 The energy conservation

同风冷式冷凝器相比，蒸发式冷凝器冷凝温度较低。而冷凝温度每升高1℃，单位制冷量的耗电量将增加3%~3.5%，所以采用蒸发式冷凝器总功耗也会显著降低，节能效果明显。

Compared with air cooling condenser, evaporative condenser condensation temperature is low. And condensing temperature rise per 1 °C, the refrigerating capacity of the unit power consumption will increase by 3% ~ 3.5%, so the total power consumption of evaporative condenser will be significantly reduced, energy saving effect is obvious.

● 节水 The water saving

蒸发式冷凝器充分利用水的汽化潜热，因而大大减少了水的损耗，对于我国水资源严重不足的北方地区有重要的意义。

Evaporative condenser make full use of the latent heat of vaporization of water, Thus greatly reduce the loss of water, for the shortage of water resources in our country has an important significance in northern China.

● 结构紧凑，节省投资费用 Compact structure, save the investment cost

由于不需另外设置冷却塔，故整个装置结构紧凑、体积小、占地面积少，蒸发式冷凝器通过把冷凝器盘管和冷却塔结合成一体节省了宝贵的空间。由于蒸发式冷凝器高效率地利用蒸发式冷却换热方式，所以能有效地减少换热面积、风扇的数量和风机电机功耗。

Because do not need to set other cooling tower, so the whole device has the advantages of compact structure, small volume, covers an area of less, evaporative condenser through the condenser coil and cooling tower combined into an organic whole to save valuable space. Because of the evaporative condenser efficient way of heat transfer, so can reduce the heat transfer area, the number of the fan and fan motor power consumption effectively.

● 不污染环境 Do not pollute the environment

不少化工厂以往采用管壳式或淋激式冷凝器，夏季时由于冷凝压力过高，常采用“放空降压”，但每次放出的并不是不凝性气体，其中含有大量的氨气，据有关部门取样分析，有时高达90%，不仅氨损失相当严重，还造成环境污染。但用蒸发式冷凝器后不存在这种现象。

Many chemical plant used the past tube shell type or spray condenser, in the summer due to the condensing pressure is too high, "empty step-down" is often used, but it is not no non-condensable gas, which contains a large amount of ammonia, according to the relevant departments of the sampling analysis, as high as 90% sometimes, not only ammonia loss serious, also cause environmental pollution. But there is no this kind of phenomenon after using evaporative condenser.

复合流系列 Compound flow series

工作原理 Process principle

工作流体在盘管中流动，盘管外壁被喷淋水包裹，流体的热量通过管壁传递与水形成饱和湿蒸汽，热量由风机排入大气，水分被挡回水槽循环喷淋，消耗量极少，喷淋水在循环的过程中通过PVC散热片降低水温，与新鲜入风形成风水同向流动。盘管主要依靠显热热传导方式，特别适合于高温流体的冷却。

Working fluid is flowing inside of the coils, which is enwrapped by spray water on the outside. The heat of water is transferred by coil and become the saturated vapor when meet the water and air. The heat is exhausted out of the tower by the fan; water is collected back to the bottom tank. The spray water is cooled down via PVC radiation fin in the process of circulation, and flows in the same direction with the fresh wind. The coil mainly takes sensible heat travel tylse. And this will apply especially to dealing with high temperature fluid.



产品特点 Product Characteristics

● 维修方便 (Easy to maintain)

巨大的维修空间，为设备的检修提供变革性的便利，可在运行条件下通过检修门入塔内维修。

The huge inside spare space is convenient for people to get into and examine and fix.

● 防止结垢 (Avoiding scaling)

较佳的水覆盖与管外表，由于空气和喷淋水以顺畅、平行和向下的路径流过盘管表面，维持了完全管外覆盖。从而消除了有利于水垢形成的干点。

Better water coverage around the tubes is due to air and spray water flowing in smooth, parallel, downward path over the coil, promoting dry spots since the water is not stripped from the underside of the tubes by the airflow.



蒸发式冷凝器工作原理图 Mixed flow series principle of operation

冷却后的喷淋水增加了水和较热的工艺流体之间的温度差，从而降低了盘管的尺寸，减少了盘管的连接点并减轻了盘管的重量。该特征更进一步减缓了在盘管表面形成结垢的趋势，这是由于较低温度的水在结垢后形成的合成物上提供了较高的溶解度。

The cooled water increases the temperature differential between the water and the warm process fluid, which results in a reduced coil size, fewer coil connections, and reduced weights. This feature further reduces the tendency to form scale on the coil since cooler water offers higher solubility for scale producing compounds.

循环喷淋水从盘管上落至PVC换热填料上，并于PVC换热填料上由第二股新鲜空气通过蒸发和显热式的热传导进行冷却。

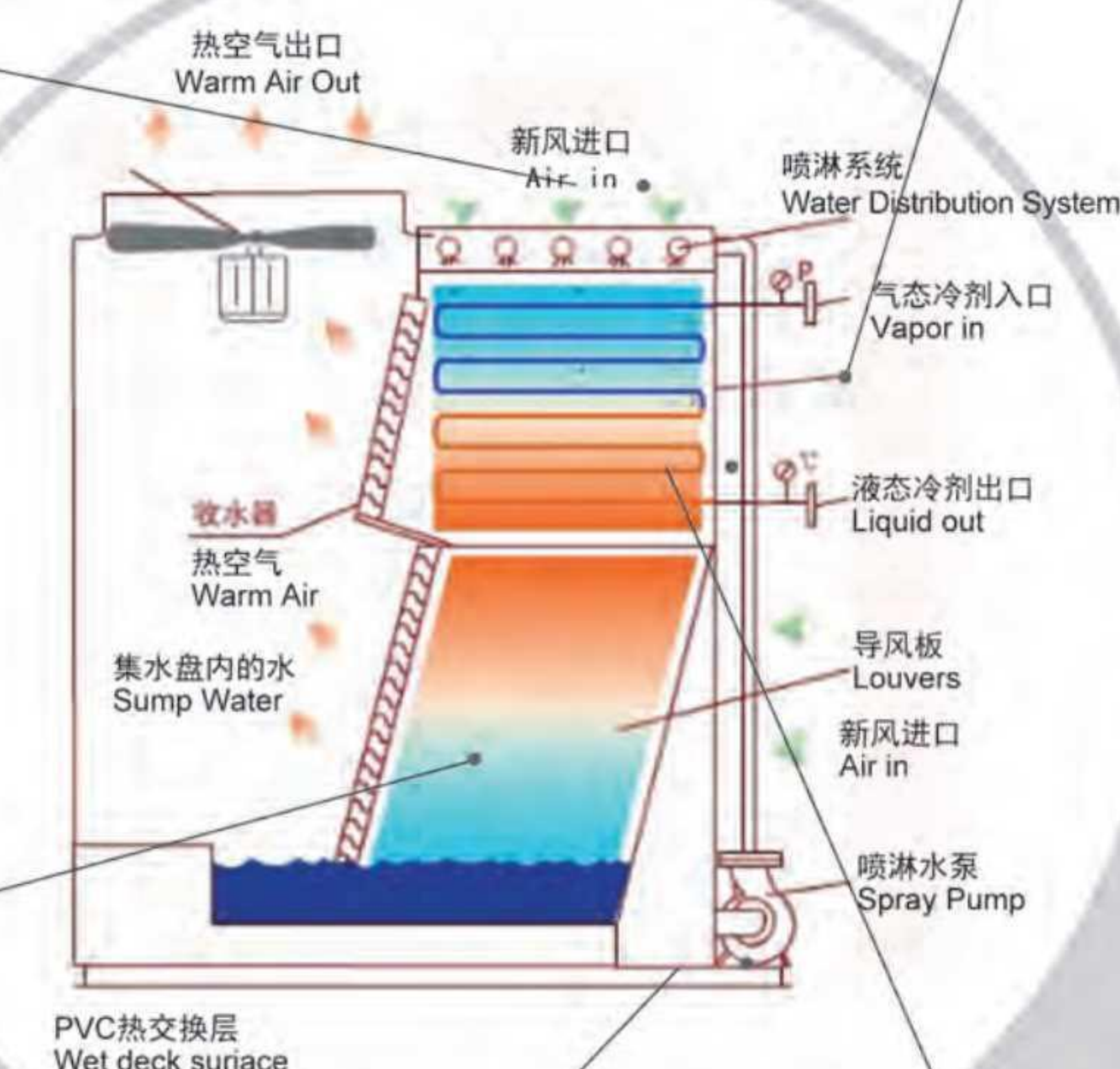
The recirculating spray water falls from the coil to a wet deck surface where it is cooled by a second fresh air stream using both evaporative and sensible heat transfer processes.

将流量最小为6.5l/m2的水通过水泵打到盘管表面上，以确保主要的传热表面上连续浸润的状态，从而提高热传导率，并将结垢降低到最低程度。

Water is pumped over the evaporative coil at a 6.8l/m2 of coil face area to ensure continuous flooding of the primary heat transfer surface which enhances heat transfer efficiency and minimizes fouling and scale formation.

平行的气流和水使传统设计的设备在管子底部出现的能够导致结垢的干点现象降低到最低程度。

Parallel air and water paths minimize scale-producing dry spots that may be found on the bottom of tubes in conventional units



盘管段一方面通过新鲜空气的蒸发冷却作用来散热，另一方面更大程度的通过预冷却喷淋水的显热冷却作用来散热。降低盘管中蒸发冷却的部分有助于减少盘管表面结垢的可能性。

The coil section rejects heat through both evaporative cooling using the fresh air stream and, more significantly, through sensible cooling using the pre-cooled re-circulating spray water. Reducing this evaporative cooling component from the coil helps to minimize the propensity to form scale on the coil surface.

逆流系列 Counter flow series

工作原理 Process principle

进风形式为底部逆流进风，与下落的喷淋水逆向交替形成饱和湿热空气，热量由顶部风机排出，水分由特殊结构的脱水器回收水槽循环使用，内部空间没有换热填料，腾出更多的空间增加盘管的单位散热面积，结构更紧凑、占地小。特别适合用于温度较接近当地湿球温度的情况。

The air intake style is inlet from the bottom of the tower, which is a lternating direction interactive with the fall down spray water and form to saturated vapor in the process. The heat is exhausted out of tower by the fan and the water is collected to bottom tank and circulate continuously by the special evaporator. There is no heat sinking fillings inside of the tower, so more space is saved to increase coil' s radiating area. Tight structure lead to little area take up. This apply especially to dealing with low temperature fluid.



产品特点 Product Characteristics

● 结构更紧凑 (Tight structure)

由于减少了换热填料的空间，使得该类型设备结构更加紧凑，占用空间更小，运输安装方便。更适合用于环境恶劣的场所，如炼铁厂，铸造厂及各类厂矿企业。

Without heat exchange filling, makes the structure of this type unit tighter, less occupied space. More suitable for being used in severe environments such as Steel-making Factory, Foundry, Mine Factory ect.

● 椭圆管设计 (Elliptical Tube Design)

换热管设计成椭圆管，排列更为紧密，相比圆管流体充注量更少，同时可以降低空气的流动阻力。

Compared with round tube, using elliptical tube as heat exchanger coils can make the form tighter, less filling rate of liquid and less air flow resistance.

● 预冷翅片设计 (Precooling Fin Design)

可增加预冷翅片，实现高温预冷和低温停水，更适合严重缺水地区。

We can increase the precooling fin on the cooling tower, Precooling of high temperature or stop the water at low temperature. More suitable for serious water shortage area.



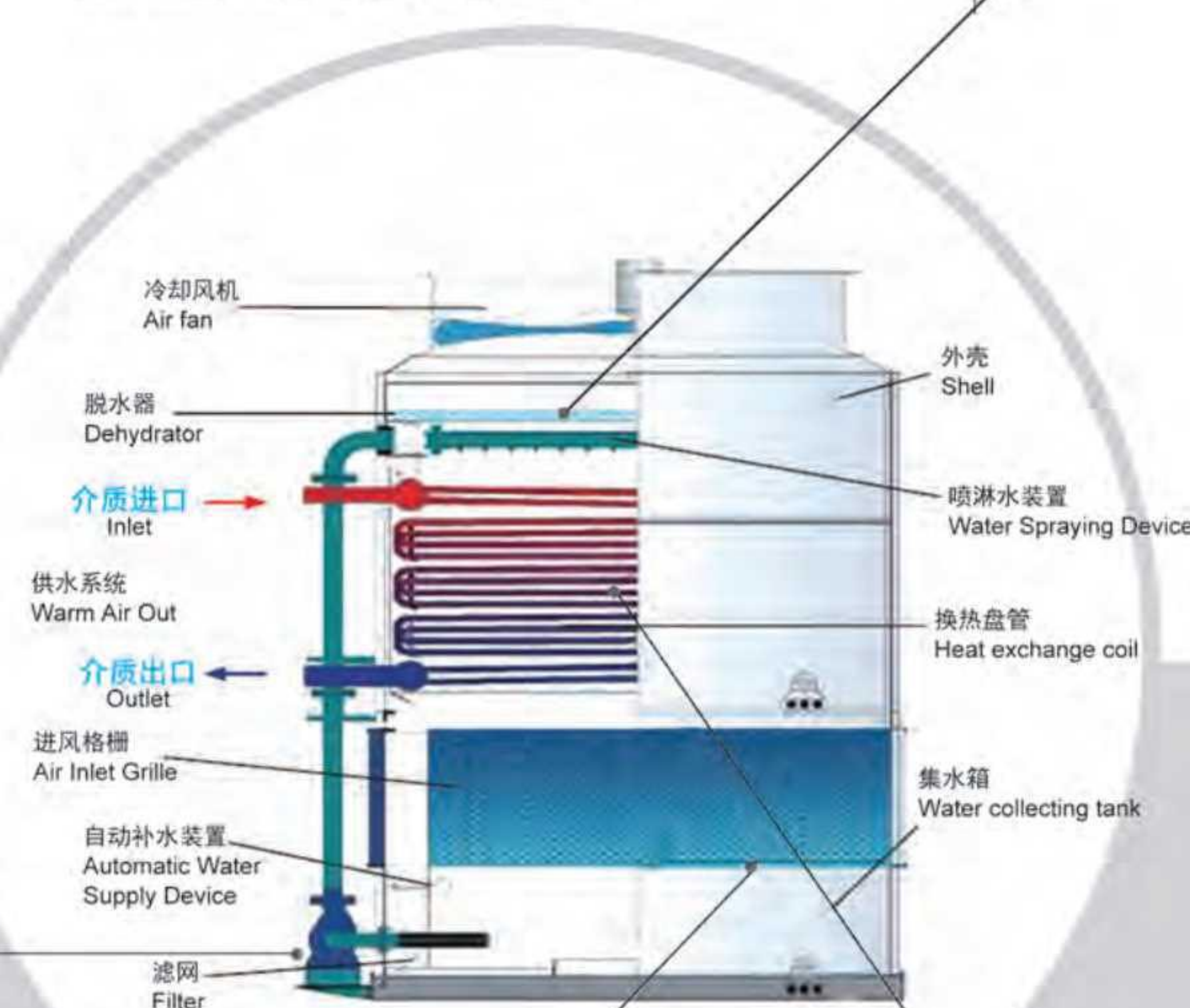
蒸发式冷凝器逆流系列工作原理图 Mixed flow series principle of operation

将流量最小为6.8l/m²的水通过水泵打到盘管表面上，以确保主要的传热表面上连续浸润的状态，从而提高热传导率，并将结垢降低到最低程度。

Water is pumped over the evaporative coil at a 6.8l/m² of coil face area to ensure continuous flooding of the primary heat transfer surface which enhances heat transfer efficiency and minimizes fouling and scale formation.

高效的脱水器，由PVC材料制成，可去除排出气流中夹带的水滴，耐辐射，寿命长。并在挡水板侧面板开有检修口。

High-effect water eliminator is made of PVC, can filter the drips from expelted airstreams. Radiation-enduring and long lifespan.



最新改进的进风格栅，进入水盘时拆卸方便，防止阳光直射，并避免了水藻的产生，防止灰尘和赃物进入机组。

Easy removable air inlet grating avoids sun projectivity dust and dirt coming in.

在管子内可能沉积可溶性污垢或污泥的条件下，采用可清洁式集箱盘管束。

For applications that might deposit soluble scale or sludge within the tubes, the cleannable header tube bundle provides removable cover plates

蒸发式冷凝器结构及主要部件说明 Structure and main parts

风机 (Propeller Fan)

TYZH/TYZN 系列蒸发式冷凝器采用蒸发冷专用铝合金轴流风机, 前倾式风叶结构设计, 流线型入口风筒, 风阻小、风量大、噪音低、性能佳、效率高。无皮带传动的结构, 减少了传动部件, 并采用全封闭自冷式低噪音蒸发冷专用电机, 具有体积小、重量轻、启动性能佳、运行可靠、经久耐用等优点。

The ventilating system of TYZH/TYZN adopts the aluminum alloy propeller fan dedicated for cooling tower with high blowing rate, low damping, low noises, good performance and high efficiency. The motor is closed and self cooling. It has the advantages of small size, light weight, good start ability, reliable operation, long lifetime and so on.



循环泵 (Water Circulating Pump)



循环泵采用不受转向限制的优质机械密封, 无泄漏, 寿命长。并选用专用户外型电机, 特殊配置的进口轴承保证机泵长期可靠运行, 具有小功率, 大流量, 低噪音, 性能优异等特点。

It is sealed by good machinery without any leakage. It adopts Special outdoor motor. And the imported bearing with special collocation can ensure the pump along time steadily run. It has the advantages of low power rating, large discharge, low noises and excellent performance etc.

采用进口镀锌锌板 (Imported board of Zinc-plate and Aluminum-plate)

产品外壳采用进口镀锌锌板, 它是当今耐腐蚀性能最强的板材之一, 使用寿命是普通镀锌板的3~6倍。并且具有阻热性强、耐热性高、外表美观等优点。

The outer shells Series Products are all made of imported board of Zinc-Plate and Aluminum-Plate with the best stain resistance. Its lifetime is 3 to 6 times of that of the common ones. This kind of Stain steel has the advantages of strong heat resistance and beautiful appearance.

盐酸喷雾1000小时试验及曝晒试验



普通镀锌板

镀锌锌板

17年户外曝晒

表冷器 (Condensing coils)



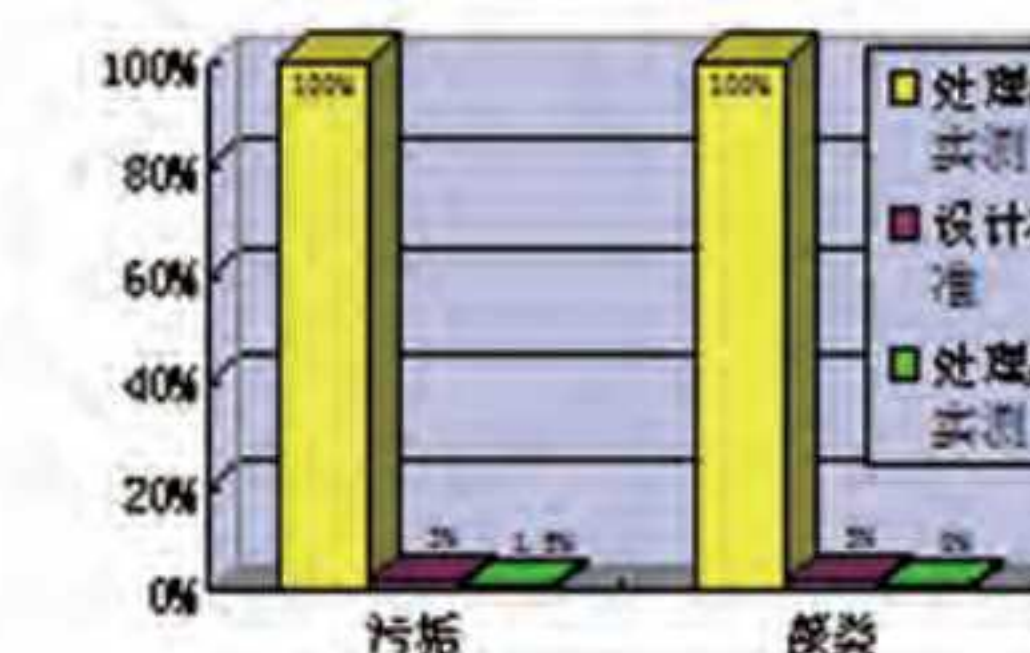
表冷器由优质的无缝流体管制成, 冷却盘管组的整体热浸锌处理, 增强了盘管防腐能力, 延长了使用寿命, 盘管沿制冷剂流向倾斜便于液体排出, 盘管压力降低。

The condensing coils are made of high-quality seamless steel pipes. The coils are galvanized to avoid being rotten. The slope of coils helps the discharge of liquid. The differential pressure of the coil is small.

电子水处理仪 (Electronic Water-Curing Device)

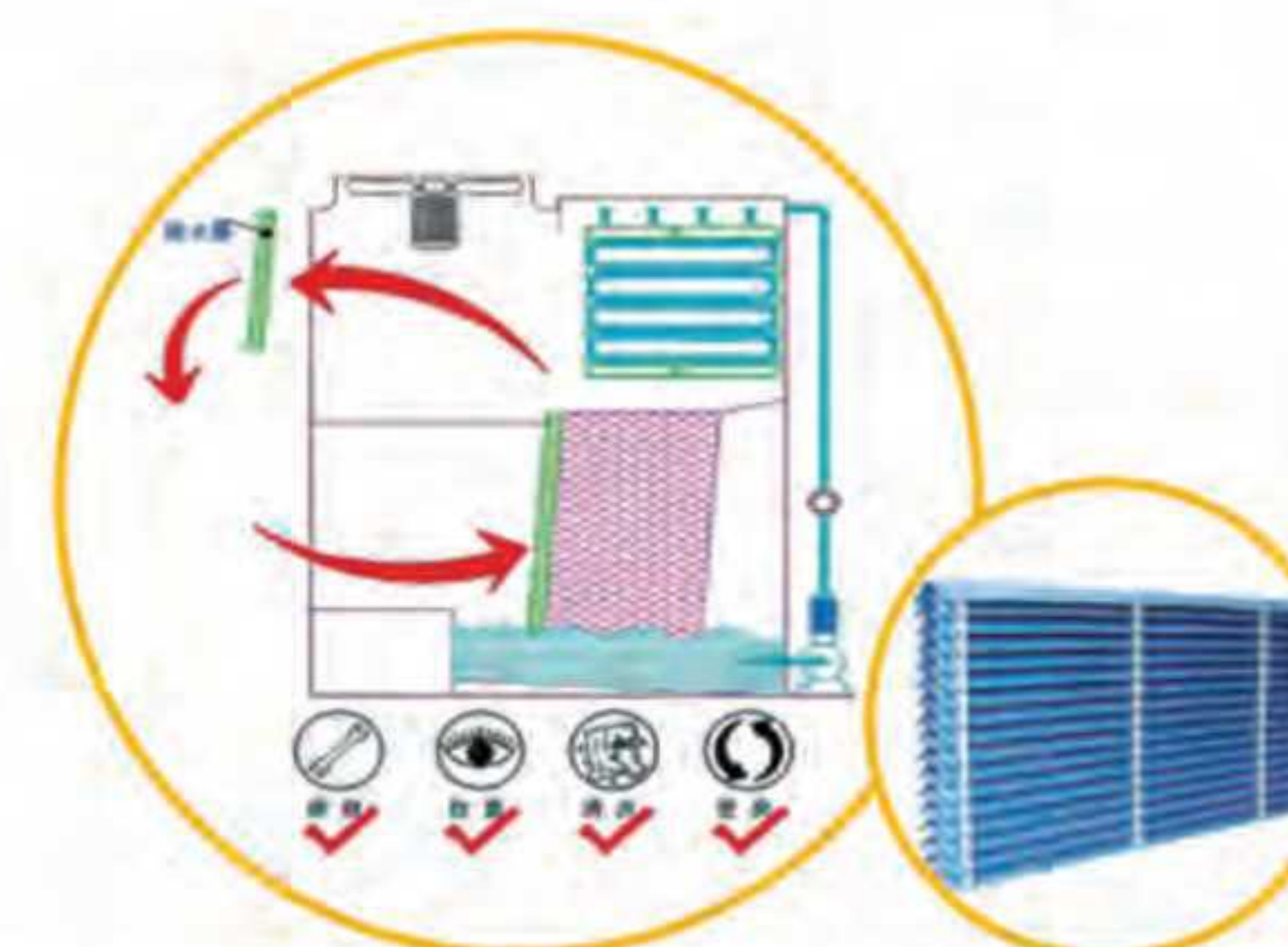
配置先进的电子水除垢仪, 其利用电子脉冲技术对循环水进行防垢除垢、杀菌灭藻的处理。您只需接通220V电源即可对循环水水质进行处理, 有效的避免了盘管壁、填料上污垢的形成。

The electronic water-curing device is very advanced and works under 220V power supply. It can help the condenser to antiscaling, descale, sterilize and eliminate alga, activating the circular cooling water.



注: 此表据上海交通大学低温研究与测试中心数据编

可拆式除水器 (Set Up Dehydrator)



产品独创的可拆式除水器采用耐腐蚀PVC材料, 其结构通过改变气流流向, 能有效地去除从盘管中出来的湿空气水份, 使水的飘逸率降低至0.01%以下。当清洗填料时, 可方便的将除水器卸除。

The dehydrator series products is made of specially designed non-corroding PVC material. The special structure can get rid of the air moisture coming out from the coil pipe in order to Change the air current 0.01%. It is very convenient to disconnect the dehydrator when cleaning the material.

先进的水分配系统 (Advantage Water Distribution System)

产品冷却水喷淋系统采用大流量防堵塞的提篮式喷嘴, 保证了布水的连续均匀喷洒在盘管表面上的水, 在引风的作用下让水最大限度的覆盖于盘管表面, 使水、空气与制冷剂充分进行热交换, 从而提高了传热效果。喷嘴扣接于喷淋支管上, 当清洗喷嘴及喷淋支管时方便将其拆卸。

Cooling water spray system adopts large discharge and anti-blockage nozzles, which can ensure the cooling water furthest contact the condensing coil and hence overcome the fouling and promote the moisture to vaporize, thus improve the effect of heat transfer. The nozzles can be easily disconnected from spray branch pipes when cleaning.



PVC填料热交换层 (PVC Wet Deck)



特殊设计的PVC蜂窝式横流填料, 捷径的横进风结构, 使空气能迅速带走水中的热量。独特的填料流道, 使水流在填料表面能形成大面积的流动水膜, 延长了水在填料里的冷却时间, 提高了水冷却效果。具有风阻系数小、抗老化、不易变形等优点。



BHX series products adopt PVC honeycomb type stuffing. The short horizontal air-inlet design can help the cool air take away the heat of water immediately. Special filling pipe can make water change to float water velum. It will prolong the time of the water staying in pipe and it will have good heat exchanging effect. And it has the advantages of aging resistance, deforming resistance and

蒸发式冷凝器的选型 Choice measure of the products

设备选型

Choosing unstructions

- 确定系统总排热量：总排热量 = 管内介质冷凝汽化潜热 + 介质冷却的散热量（制冷系统可根据系统制冷量选型）；
- 确定设计条件：进出口温度、冷凝温度及当地的湿球温度；查排热量修正系数表，确定修正系数；
- 确定修正排热量：修正排热量 = 总排热量 × 修正系数；
- 选择蒸发式冷凝器：从技术参数表中选择标准排热量等于或大于计算出的修正排热量的蒸发式冷凝器。

- determine the system total calories: total row heat medium = tube condensation latent heat of vaporization + cooling medium heat
- determine the design conditions: temperature of import and export, condensation temperature and wet bulb temperature ;
- check graph, determine the correction coefficient;
- determine the correct row heat: = total heat released by correction coefficient;
- choose the evaporative condenser: The heat rejection of the chosen type should no less than corrected heat rejection.

举例

Example

- (以常用氨制冷为例)
- 氨制冷系统总排热量为1200KW。(压缩机制冷量+压缩机轴功率=总排热量)
 - 使用条件：冷凝温度36℃，湿球温度28℃。
 - 查表，排热量校正系数为1.35。
 - 计算冷凝器的实际负荷：1200KW×1.35=1620 KW
 - TYZ选型表，选TYZ-1765H型蒸发式冷凝器，其排热量>1620KW。
- (ammonia refrigeration for example)
- the ammonia refrigeration system total exhaust heat of 1200 kw. (compressor refrigerating capacity + compressor shaft power = total heat released)
 - operating condition: condensation temperature of 36 °C, wet bulb temperature 28 °C.
 - check graph 1, correction coefficient is 1.35.
 - calculate the actual load of the condenser: 1200 KW x 1.35 = 1620 KW
 - check TYZ graph, choose type of TYZ – 1765H, and its heat rejection > 1620 kw.

选型方法注意事项

Instructions for choosing a type

- 设备配置表中的数据仅供参考；
- 表中运行重量为设备重量加介质充注量及底部水盘贮水的重量；
- 用户非标准特殊要求可代为用户设计制造；
- 表中的名义工况排热量是指冷凝温度为37℃，使用地夏季湿球温度为26摄氏度时的数据。
- The value in the graph are just for reference.
- The running weight of the table equals the weight of equipment plus the refrigerant and the water in the bottom reservoir.
- To design and manufacture for client' s special requiremngs if necessary.
- The heat-exchange quantity of nominal conditions in the sheet refers to the data about condensing temperature(TK)=37℃, air inlet wet blub temperature(TS)=26℃.

R717 排热量校正系数表

Heat rejection correction index for R717

冷凝温度 Condensing temperature	空气进口湿球温度 (°C) Air inlet wet bulb temperature																	
℃	10	12	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
29	0.80	0.87	0.95	1.07	1.12	1.21	1.31	1.44	1.59	1.78	2.04	2.40	2.95	/	/	/	/	/
30	0.75	0.81	0.90	0.98	1.04	1.11	1.19	1.28	1.41	1.55	1.76	1.99	2.36	/	/	/	/	/
31	0.71	0.75	0.82	0.91	0.95	1.01	1.08	1.15	1.24	1.35	1.51	1.69	1.93	2.29	/	/	/	/
32	0.68	0.72	0.77	0.82	0.89	0.93	0.99	1.05	1.13	1.22	1.33	1.49	1.65	1.89	2.24	/	/	/
33	0.63	0.68	0.72	0.78	0.81	0.87	0.91	0.97	1.02	1.10	1.19	1.29	1.43	1.61	1.84	2.18	/	/
34	0.61	0.64	0.69	0.73	0.77	0.80	0.84	0.89	0.94	1.00	1.07	1.15	1.27	1.41	1.58	1.81	2.11	/
35	0.58	0.60	0.64	0.69	0.71	0.74	0.78	0.81	0.87	0.92	0.98	1.04	1.13	1.23	1.37	1.52	1.76	2.05
36	0.56	0.58	0.61	0.65	0.68	0.70	0.73	0.77	0.80	0.83	0.90	0.95	1.02	1.11	1.21	1.35	1.50	1.74
37	0.52	0.54	0.58	0.61	0.63	0.65	0.68	0.71	0.74	0.78	0.81	0.88	0.93	1.00	1.08	1.18	1.34	1.48
38	0.50	0.52	0.56	0.59	0.61	0.62	0.64	0.67	0.69	0.72	0.75	0.80	0.84	0.91	0.98	1.07	1.15	1.32
39	0.48	0.50	0.52	0.56	0.58	0.59	0.60	0.62	0.64	0.68	0.70	0.74	0.78	0.82	0.89	0.95	1.05	1.15
40	0.47	0.48	0.50	0.53	0.54	0.56	0.58	0.59	0.61	0.64	0.67	0.69	0.73	0.77	0.81	0.87	0.94	1.03
41	0.44	0.46	0.48	0.50	0.51	0.52	0.54	0.56	0.58	0.60	0.62	0.64	0.68	0.71	0.74	0.79	0.84	0.92
42	0.43	0.44	0.46	0.48	0.49	0.50	0.52	0.53	0.54	0.57	0.59	0.61	0.63	0.67	0.69	0.73	0.78	0.82
43	0.41	0.42	0.43	0.46	0.47	0.48	0.49	0.50	0.51	0.53	0.56	0.57	0.59	0.61	0.64	0.68	0.72	0.77
44	0.40	0.41	0.42	0.43	0.44	0.46	0.47	0.48	0.49	0.51	0.52	0.54	0.56	0.58	0.60	0.63	0.67	0.70
45	0.38	0.39	0.40	0.41	0.42	0.43	0.44	0.46	0.47	0.48	0.49	0.51	0.52	0.54	0.57	0.59	0.62	0.64

R22和R134a 排热量校正系数表

Heat rejection correction index for R22 and R134a

冷凝温度 Condensing temperature	空气进口湿球温度 (°C) Air inlet wet bulb temperature																	
℃	10	12	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
29	0.99	1.08	1.19	1.32	1.44	1.50	1.62	1.79	1.96	2.20	2.53	2.97	3.66	/	/	/	/	/
30	0.93	1.01	1.11	1.21	1.30	1.42	1.48	1.59	1.74	1.93	2.19	2.46	2.93	/	/	/	/	/
31	0.88	0.93	1.02	1.13	1.19	1.25	1.33	1.43	1.54	1.68	1.88	2.09	2.40	2.83	/	/	/	/
32	0.84	0.90	0.95	1.02	1.10	1.15	1.22	1.31	1.40	1.51	1.65	1.84	2.05	2.34	2.78	/	/	/
33	0.79	0.84	0.90	0.97	1.01	1.08	1.13	1.20	1.27	1.37	1.48	1.60	1.78	2.00	2.29	2.70	/	/
34	0.75	0.80	0.85	0.91	0.95	0.99	1.04	1.10	1.17	1.24	1.32	1.43	1.57	1.74	1.95	2.24	2.59	/
35	0.71	0.74	0.80	0.85	0.88	0.92	0.97	1.01	1.08	1.14	1.21	1.30	1.40	1.53	1.70	1.89	2.19	2.54
36	0.69	0.71	0.75	0.81	0.84	0.87	0.91	0.95	0.99	1.03	1.11	1.19	1.27	1.38	1.50	1.68	1.85	2.16
37	0.64	0.68	0.71	0.75	0.79	0.81	0.84	0.88	0.92	0.97	1.01	1.09	1.15	1.24	1.33	1.45	1.67	1.83
38	0.62	0.64	0.69	0.73	0.75	0.77	0.80	0.82	0.85	0.90	0.93	0.99	1.04	1.13	1.21	1.32	1.43	1.64
39	0.59	0.62	0.64	0.69	0.71	0.73	0.74	0.77	0.80	0.84	0.87	0.92	0.97	1.02	1.10	1.19	1.31	1.43
40	0.58	0.59	0.62	0.67	0.68	0.69	0.71	0.73	0.75	0.80	0.82	0.85	0.91	0.95	1.01	1.08	1.17	1.28
41	0.56	0.57	0.59	0.62	0.63	0.64	0.68	0.69	0.71	0.74	0.77	0.80	0.84	0.88	0.92	0.98	1.04	1.14
42	0.53	0.56	0.57	0.59	0.61	0.62	0.64	0.67	0.68	0.70	0.73	0.75	0.79	0.82	0.85	0.91	0.97	1.02
43	0.51	0.52	0.53	0.57	0.58	0.59	0.61	0.62	0.63	0.67	0.69	0.70	0.73	0.75	0.80	0.84	0.90	0.95
44	0.50	0.51	0.52	0.53	0.56	0.57	0.58	0.59	0.61	0.63	0.64	0.68	0.69	0.71	0.74	0.79	0.82	0.87
45	0.47	0.48	0.50	0.51	0.52	0.53	0.56	0.57	0.58	0.59	0.61	0.63	0.64	0.68	0.70	0.73	0.77	0.80

TYZH系列复合流蒸发式冷凝器工程参数表

型号 Type	名义排热量 heatref lection	风机功率 FAN MOTOR (kW)	风量 AIR FLOW (m3/h)	水泵功率 PUMP MOTOR (kW)	淋水量 AMOUNT OF WATER (m3/h)	接管口径 INTAKEPORT DN(mm)	近似重量 APPROX. WEIGHT (kg)		外形尺寸 DIMENSION		
							运输重量 SHIPPING	运行重量 OPERATING	总长 lenth	总宽 width	总高 height
TYZ-320H	320	3	46000	0.75	28	DN80	2320	3660	1785	2380	4220
TYZ-380H	380	4	60000	1.1	45	DN80	2340	3680	1785	2380	4220
TYZ-475H	475	5.5	75000	1.1	45	DN100	2700	4750	1925	2380	4220
TYZ-595H	595	7.5	87000	1.5	65	DN100	3320	4990	1925	2980	4240
TYZ-735H	735	7.5	100000	2.2	65	DN100	3810	5900	1925	2980	4870
TYZ-850H	850	2-4	2-65000	1.5	100	DN100	4650	7290	3490	2380	4240
TYZ-1050H	1050	2-5.5	2-72000	2.2	100	DN100	4960	7630	3770	2380	4240
TYZ-1285H	1285	2-5.5	2-75000	3	140	2-DN100	6090	10230	3770	2580	4870
TYZ-1490H	1490	2-7.5	2-87000	3	140	2-DN100	7070	11270	3770	2980	4870
TYZ-1765H	1765	3-5.5	3-75000	4	180	2-DN100	8050	13920	5610	2380	4965
TYZ-2010H	2010	3-7.5	3-87000	4	180	2-DN100	8830	14730	5610	2580	4965
TYZ-2245H	2245	3-7.5	3-87000	5.5	233	2-DN100	9790	16050	5610	2980	4965
TYZ-2450H	2450	3-7.5	4-100000	5.5	233	2-DN125	10450	16850	5610	3210	4965
TYZ-2600H	2600	3-7.5	3-100000	5.5	233	2-DN125	11020	17380	5610	3420	4965
TYZ-2850H	2850	3-11	3-125000	5.5	233	2-DN125	12050	17450	5610	3420	4965
TYZ-3000H	3000	4-7.5	4-870000	7.5	286	2-DN125	13590	20290	7450	2980	4965
TYZ-3400H	3400	4-7.5	4-870000	7.5	286	2-DN150	14340	21440	7450	3210	4965
TYZ-3800H	3800	4-7.5	4-100000	7.5	286	2-DN150	15200	22900	7450	3420	4965
TYZ-4200H	4200	4-11	4-125000	7.5	286	2-DN150	15700	23700	7450	3420	5150
TYZ-4600H	4600	4-11	5-125000	2-4	2-180	2-DN200	16020	23900	7450	3600	5150
TYZ-5200H	5000	5-11	5-125000	2-4	2-180	2-DN200	18500	27650	8860	3600	5150

注意:

1.该数据不可用于制造。本手册中的数据只是在出版时有效的数据,在购买时要重新确认。

2.所有盘管接口的位置是大约的,不应使用此尺寸来预接管。

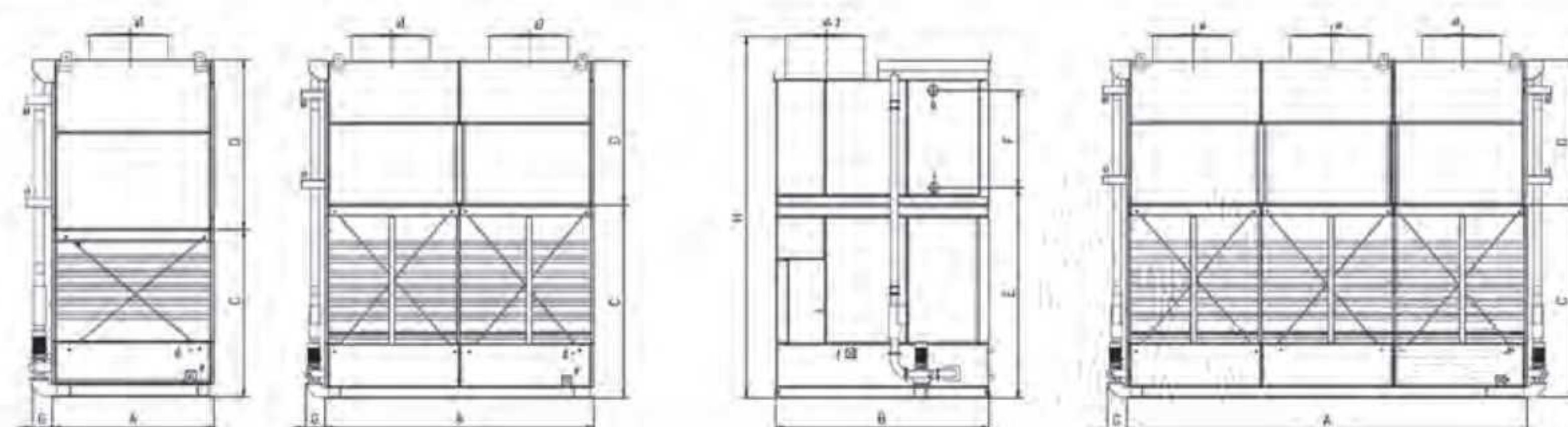
3本数据表设计条件:湿球温度26℃,冷凝温度36℃

Notes:

1. Do not for construction. This brochure includes data current at the time of publication which should be reconfirmed at the time of purchase.

2. All location dimensions for coil connections are approximate and should not be used for prefabrication of connecting piping.

3.Design conditions:Wet bulb temperature=26°C



TYZN系列逆流蒸发式冷凝器工程参数表

型号 Type	名义排热量 heatref lection	风机功率 FAN MOTOR (kW)	风量 AIR FLOW (m ³ /h)	水泵功率 PUMP MOTOR (kW)	淋水量 AMOUNT OF WATER (m ³ /h)	接管口径 INTAKE/EXPORT DN (mm)	近似重量 APPROX WEIGHT (kg)		外形尺寸 DIMENSION		
							运输重量 SHIPPING	运行重量 OPERATING	总长 length	总宽 width	总高 height
TYZ-320N	320	3	45000	0.75	28	DN80	2450	4150	1925	1840	3650
TYZ-380N	380	4	65000	1.1	45	DN80	2670	4370	1925	1840	3650
TYZ-475N	475	5.5	72000	1.5	65	DN80	3060	4760	1925	1840	3900
TYZ-595N	595	7.5	87000	1.5	65	DN80	3820	5320	2470	1840	4100
TYZ-735N	735	7.5	100000	2.2	100	DN100	5030	8380	2470	2380	4100
TYZ-850N	850	2-4	2-65000	2.2	140	DN100	5600	8970	3770	1840	4310
TYZ-1050N	1050	2-5.5	2-75000	2.2	140	DN100	6482	9869	3770	1840	4310
TYZ-1285N	1285	2-5.5	2-75000	3	140	2-DN100	7670	11670	3770	2380	4510
TYZ-1490N	1490	2-7.5	2-100000	3	140	2-DN100	8655	12555	3770	2980	4510
TYZ-1765N	1765	3-5.5	3-75000	4	180	2-DN100	10580	15680	5610	2380	4550
TYZ-2010N	2010	3-5.5	3-75000	4	180	2-DN100	11880	16980	5610	2380	4550
TYZ-2245N	2245	2-11	2-125000	4	180	3-DN100	12850	19150	4846	2980	4630
TYZ-2450N	2450	2-11	2-125000	5.5	233	4-DN100	13920	20620	6046	2980	4830
TYZ-2600N	2600	2-11	2-125000	5.5	233	4-DN100	14100	20800	6046	2980	4830
TYZ-2850N	2850	2-15	2-180000	5.5	233	4-DN100	14500	21200	6046	2980	4830
TYZ-3000N	3000	2-15	2-160000	7.5	286	4-DN100	15550	23430	6046	3164	4830
TYZ-3400N	3400	3-11	3-125000	7.5	286	5-DN100	18640	27200	7230	2980	4830
TYZ-3800N	3800	3-11	3-125000	2-4	2-180	5-DN100	20840	30590	8000	2980	4830
TYZ-4200N	4200	3-15	3-160000	2-4	2-180	6-DN100	21740	32600	9030	3164	4970
TYZ-4600N	4600	3-15	3-160000	2-4	2-180	6-DN125	23740	36340	9350	3164	4970
TYZ-5200N	5000	3-18.5	3-200000	2-5.5	2-233	6-DN150	27240	47240	10150	3164	4970

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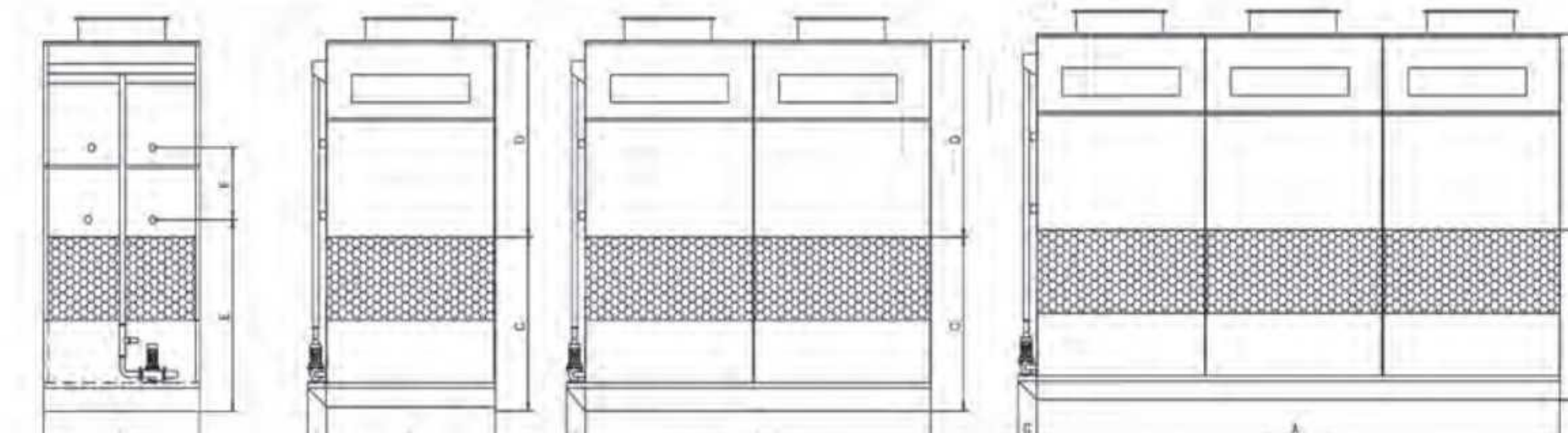
3.本数据表设计条件:湿球温度 26°C ,冷凝温度 36°C

Notes:

1. Do not for construction. This brochure includes data current at the time of publication which should be reconfirmed at the time of purchase.

2. All location dimensions for coil connections are approximate and should not be used for prefabrication of connecting piping.

3. Design conditions: Wet bulb temperature = 26°C



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