# ECOOL AIR CO. LIMITED

eca

## *2018 Asia International Innovation Award*
## 榮獲2018亞洲國際創新發明大獎和金獎


**Patented Plate-Tube Liquid Film Evaporative Technology**

板管平面液膜蒸發技術 (專利)

# 全球專利技術

ETCO

***The International Leader of Plate-tube Evaporative Condensed Chiller***

ETCO板管蒸發冷卻式空調技術國際領導者

**Global Warming Effect:** Many businesses in Hong Kong and Macau have suffered from frequent **high cut** stops of their air-con chillers during the summer, resulting from unusual high temperature due to global warming. To overcome the **high cut** problem, why not use the ETCO Plate-Tube Evaporative Condensed Chillers? ETCO Chillers have higher dissipation of reject heat and achieve working temperature up to 43°C.

ETCO Chillers are specially designed for Hong Kong and Macau. They are environmentally friendly, energy efficient, free of Legionella and durable chiller with below remarkable advantages:

1. Easy to replace the air-cooled chiller with 35% energy saving immediately
2. Built-in ECA Physical Water Treatment System to eliminate Legionella and scale & sludge
3. Separated water cooling tower is not required, less footprint and easy for maintenance
4. Fulfill Statutory Requirement – Code of Practice for Fresh Water Cooling Towers Scheme
5. ECO Building Fund subsidies HKD 300,000/retrofitting project
6. Return On Investment (ROI) excluding funding subsidies less than 15 months and continue returns more than 10 years

**全球暖化效應：**本港和澳門地區所用的風冷式中央空調機組常於盛夏,因環境溫度上升而引致散熱不良,經常出現**高壓保護**而停機做成經濟損失。ETCO 板管蒸發式冷水中央空調機組是特別設計,散熱效果良好,受環境溫度影響較少,在環境溫度攝氏43度下仍能正常工作。

ETCO 板管蒸發式冷水中央空調機組是特別為香港、澳門環境而設計的環保、節能、除退伍軍人桿菌及特別耐用的中央空調機, 此外還具有以下明顯優點:

1. 可直接替換風冷式中央空調,無需特別改造,即時可節省電費35%
2. 內置ECA物理式水處理系統除菌除垢,免除退伍軍人桿菌和水垢的困擾
3. 無需外置冷水塔、佔地少、保養簡單容易
4. 規格完全符合香港政府機電工程署淡水冷卻塔計劃要求
5. 電力公司(Eco Building Fund 綠適樓宇基金)提供更換機組補貼30萬元/項目
6. 投資回本期(不計電力公司補貼)少於15個月和賺盡之後多年(10年以上) 的所慳電費(回本期以每天開機小時多少而定)

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## 1. ETCO Plate-tube Evaporative Condensed Chiller

ETCO Plate-tube Evaporative Condensed Chiller uses the latest evaporative condensing technology for direct cooling of refrigerant of the chiller. It is a highly energy efficient alternative to the air cooled and water cooled condensed chillers, with saving of energy over 35% and 15% respectively (see p.9).

The Chiller bases on the patented Plate-tube Liquid Film Evaporative Technology to provide cooling of condenser by direct spray of water on the condenser so then the cooling effect of the system is highly improved. It is the most efficient cooling technology at present.
This technology practices the combination of the merits of the following Refrigeration Systems :

- Compact/Simple design of Air-cooled System
- High refrigerant effect of Water-cooled System

## 1. 板管蒸發冷卻式冷水機

板管蒸發冷卻式空調,主要是用最新的蒸發式冷凝技術作為冷卻空調雪種之用。它的高效能特性較目前一般應用的風冷空調系統和水冷空調系統相比比較,可節能分別35%及15%以上(見p.9)。創新專利的板管平面液膜蒸發技術,通過熱交換系統,直接獲得接近於濕球溫度的冷卻水溫度,為大功率的冷卻水系統提供了高效能的傳遞效應,節省大量能源, 是目前最高能效的製冷技術。此技術結合了下列冷凍技術的優點:

- 風冷式冷水機組的緊密和簡單結構
- 水冷式機組的高製冷效率

## 2. Plate-tube Evaporative Condensed Chiller Working Principle (Figure 1)

Plate-tube Evaporative Condensed Chiller adopts the patented plate-tube evaporative condenser technology. It makes use of air and water as the cooling medium with the water removes the heat from condenser when water evaporates. The cooled water is pumped to the top of condenser and sprayed onto the plate-tube surface as a thin water film. The hot refrigerant gaseous enters from the top of condenser and then exits at the bottom as cooled liquid refrigerant. The heat is absorbed by water film and then be evaporated and removed by fan with air velocity ranging between 3-5 m/s. This high speed air flow increases the efficiency of heat transfer rate. The remaining water is blocked by the water retaining plate and falls into the collection basin for re-circulation.

## 2. 板管蒸發冷卻式冷水機工作原理 (圖一)

板管蒸發冷卻式水機是將冷凝器和冷卻水塔合二為一, 直接發揮水的蒸發潛熱冷卻工藝流體。它是以水和空氣作冷卻介質, 利用水的蒸發帶走氣態製冷劑的冷凝熱。工作時冷卻水由水泵送至冷凝管組上部噴嘴, 均勻地噴淋在冷凝板管外表面, 形成一層很簿的水膜, 高溫氣態製冷劑由冷凝板管組上部進入, 被板管外的冷卻水 吸收熱量冷凝成液體從下部流出, 吸收熱量的水一部份蒸發為水蒸氣, 其餘落在底部的集水盤內, 供水泵循環使用, 風機強迫空氣以3-5米/秒的速度掠過冷凝板管促使水膜蒸發, 強化冷凝板管外放熱, 并使吸熱後的水滴在下落的過程中被空氣冷卻, 蒸發的水蒸氣隨從空氣被風機排出, 仍未蒸發的水滴被脫水器阻擋跌落回水盤。

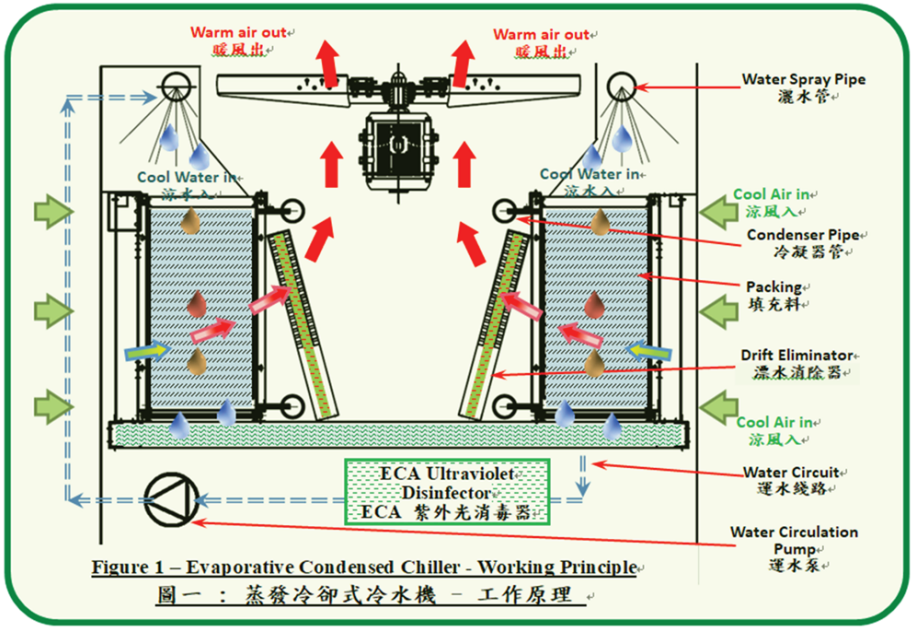



**Figure 1 – Evaporative Condensed Chiller - Working Principle**
**圖一 ： 蒸發冷卻式冷水機 – 工作原理**

The Chiller not only physically integrates the condenser and cooling tower to form a compact refrigeration system with built-in condenser pumps to simplify the air-conditioning water circulation system and improve the system efficiency, but also incorporates a number of advanced and patented technologies to further enhance the effectiveness of the chiller, includes :

- Patented Plate-tube Liquid Film Evaporative Technology
- Corrosive-resisted Hot-dip Zinc Treatment
- Highly Efficient and effective Drift Eliminator
- ECA Ultraviolet Disinfection System

板管蒸發冷卻式冷水機 不但結構上將冷凝器和冷卻水塔合二為一，充分利用水的蒸發潛熱冷卻工藝和簡化冷凝水循環系統,將能效比提高,更另引入多項專利和嶄新科技,將冷水機之效能和衛生安全再大大提高,包括:

- 平面液膜蒸發技術 (專利)
- 熱浸鋅特殊工藝處理
- 高效能飛水消除器
- ECA紫外光殺菌除垢系統

## 3. Patented Plate-tube Liquid Film Evaporative Technology

Patented Plate-Tube Liquid Film Evaporative Technology (Figure 2 & 5) is used to replace the traditional tube type evaporative condenser. It is the highest efficient condenser with lower condensing temperature (38℃) as compared to air cooled (48℃) and water cooled (40℃). The heat transfer rate of the condenser can be greatly improved and prolong the working life of the equipment (Figure 3 & see p.9). Besides it minimizes the presence of scale and sludge on surface of the condenser (Figure 5 vs Figure 6a - 6b).

## 3. 板管平面液膜蒸發技術 (專利)

板管平面液膜蒸發技術的冷凝器(圖二)是用作代替一般盤管冷凝器用作冷水機雪種之運行,普通風冷式的冷凝溫度為48℃, 水冷式的冷凝溫為40℃,而板管蒸發式的冷凝溫度在38℃以下相對壓縮機功耗更小,其他條件相同, 更低的冷凝溫度時製冷量更大,COP更高,這對壓縮機運行更穩定, 使用壽命更長(圖三及見p.9)。此外這技術亦大大減低外管垢之產生(圖五與圖六6a-6b), 把平面液膜蒸發冷凝器之導熱效能進一步提高及減低維修費用。

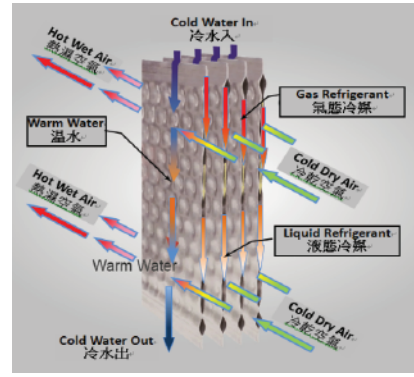



Figure 2 Patented Plate-tube
圖二 板管

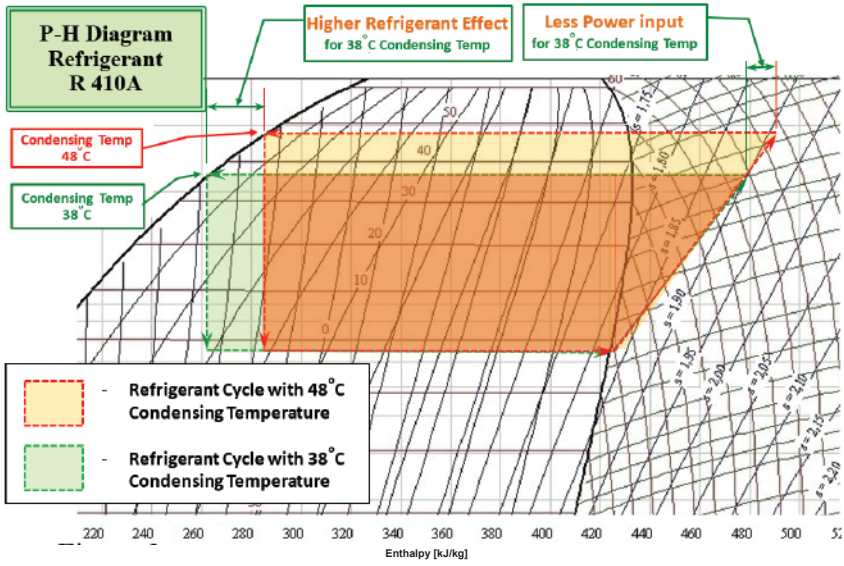


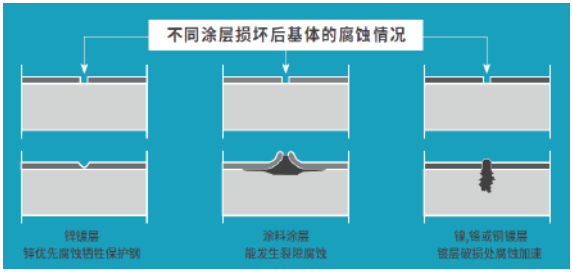

Figure 3 Pressure Enthalpy Chart
圖三 壓焓圖

## 4. Corrosive-resisted Hot-dip Zinc Treatment

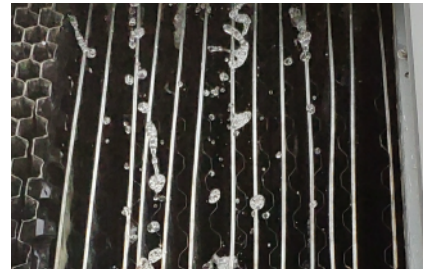
ETCO Plate-tube condenser is made of corrosive resistant material with special hot- dip zinc coating to enhance the anti-corrosive and calcium solubility properties of the condenser to ensure stable operation of the chiller by scale & sludge reduction (Figure 4 & 5).

## 4. 熱浸鋅特殊工藝處理

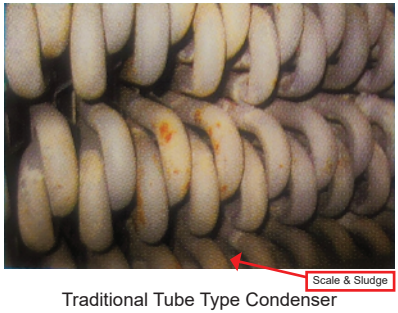
ETCO 板管蒸發式冷凝器採用超強耐腐蝕的高導熱性複合金屬材料，並進行熱浸鋅特殊工藝處理, 板管蒸發冷凝器的冷凝溫度在38℃以下，低的冷凝溫度，鈣離子的溶解度更高，冷凝器的防結垢性能更好，加上全覆蓋噴淋換熱形式，能有效防止板片結垢，從源頭上解決冷凝器結垢問題，使製冷系統運行更穩定，更加耐用。(圖四–五)



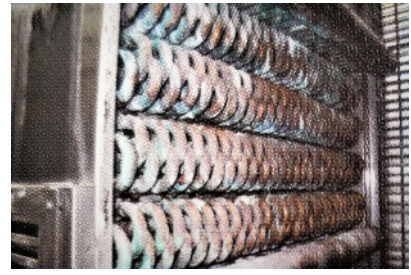

Hot-dip Zinc (left) vs Others
Figure 4 圖四



ETCO Plate-tube Type Condenser
Figure 5 圖五




Traditional Tube Type Condenser
Figure 6a 圖六a



Traditional Tube Type Condenser
Figure 6b 圖六b

## 5. Highly Efficient & Effective Drift Eliminator

The tailor-made Drift Eliminator is installed in the chiller to ensure the Drift Rate of the chiller is less than 0.005% of the maximum limit of water circulation rate (Statutory Requirement- Code of Practice for Fresh Water Cooling Towers - 2016 Edition).

Figure 7 Highly Efficient & Effective Drift Eliminator
圖七 高效能飛水消除器

## 5. 高效能飛水消除器

板管蒸發器採用專用高效能飛水消除器有效地把每一滴水用於蒸發潛熱冷卻功能,以確保飛水率低於運水量之0.005%的法例要求(機電工程署-淡水冷卻塔計劃-2016 版)。

## 6. Built-in ECA Ultraviolet Disinfection System

ECA Ultraviolet Disinfection System equipped with Water Treatment Device is specially designed for “ETCO” Chiller for the sterilization of the system to ensure the hygiene of circulation water without Legionella and increase the penetration effect of the water to minimize the creation of pipe scale and sludge.

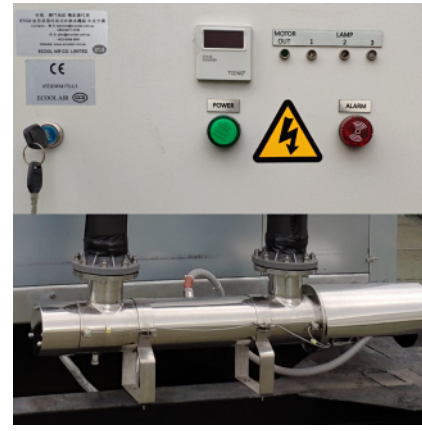



Figure 8 ECA Ultraviolet Disinfector
圖八 紫外光殺菌除垢系統

## 6. 內置ECA紫外光 殺菌除垢系統

ECA紫外光自動殺菌系統內置高能量活水器是特配” ETCO” 板管蒸發冷卻式冷水機而設,主要消除水箱內的退伍軍人桿菌和一般菌藻類的滋生及提高水的滲透性和磁滯效應,清除冷凝器和喉管內的阻垢聚積,延長冷凝器壽命及減少維護費用,集一體化設計,省地方,又衛生。

## 7. Comparison Among Different Types of Water-cooled Condenser
## 不同種類水冷式冷凝器之比較

| Types of Water-cooled Condenser<br>水冷式冷凝器種類 | Shell and Tube (Cooling Tower)<br>管殼式 | Tube Evaporative Type<br>圓管蒸發式 | ETCO Plate-tube Evaporative Type<br>板管蒸發式 |
|---|---|---|---|
| Energy Consumption<br>能源消耗 | Medium | Medium | Low |
| Heat Rejection Efficiency<br>排熱效率 | Normal | Normal | Good |
| Overall EER/COP<br>總效能係數 | High | Medium | High |
| Condenser Water Consumption<br>冷凝器耗水量 | High | Medium | Low |
| Efficient Drift Eliminator<br>高效能飛水消除器 | Normal | Normal | Good |
| Ultraviolet Disinfection System<br>內置紫外光 殺菌除垢系統 | No | No | Yes |
| Durability<br>耐用性 | Low | Low | High |
| Operation & Maintenance<br>操作和保養 | Normal | Normal | Easy |
| Space Occupation<br>佔地率 | High | Low | Low |

## 8. ETCO Plate-tube vs Air-cooled and Water-cooled types Energy Consumption
## 板管蒸發式與常規風冷式、水冷機組性能及耗能比較

| Type of Condenser<br>冷凝器種類 | Air-cooled<br>風冷式 | Water-cooled<br>水冷式 | ETCO Plate-tube<br>板管蒸發式 |
|---|---|---|---|
| Condensing Temperature<br>冷凝溫度 | 48°C以上 | 40°C左右 | 38°C以下 |
| Coefficient of Performance COP<br>效能系數 COP | 2.6 - 3.6 | 3.6 - 4.6 | 5.0 - 5.3 |
| Cooling Cap. 500kW- Rated power (kW)<br>製冷量500kW - 功率 (千瓦) | 168 | 132 | 109 |
| Annual energy consumption (kWh/year)<br>年消耗能源 (度電/年)<br>12*7*52*80% (hrs*d*wk* loading)=3494 hrs/year | 586,992 | 461,208 | 380,846 |
| Extra energy consumed (kWh/year)<br>每年多消耗電量 (度電/年) | 206,146 | 80,362 | 0 |
| Extra energy consumed %<br>多消耗電量 % | 35.12% | 17.42% | 0 |
| CLP- Eco Building Fund $300k/ Project*<br>用ETCO可獲中電綠適樓宇基金補貼$30萬/項目<br>*ETCO chiller is accepted by CLP for retrofit project | 0 | 0 | HK$300,000 |

## 9. Advantages of Plate-tube Evaporative Condensed Chiller
## 板管蒸發冷卻式冷水機之好處

- All-in-one design with high quality material construction
  集一體化設計及優質材料構造
- Improved anti-corrosive material with Hot-dip zinc treatment protection
  超強耐腐蝕複合金屬材料進行熱浸鋅特殊工藝處理
- Mixed flow of water and air stream maximizing the heat transfer between air and water
  水及空氣混合流動將熱傳送量最佳化
- Lower condensing temperature at 38℃ even lower makes the chiller more stable and longer life
  低冷凝溫度在38℃以下運作這使壓縮機運行更穩定,機組壽命更長
- Built-in condenser pump makes simple water recirculation system
  內置冷凝水泵 - 簡化水循環系統
- Low fan power consumption vs air-cooled condenser of comparable capacity
  風扇能源消耗比風冷機低
- Low water consumption vs water cooling tower
  水消耗量比水塔少
- Ultraviolet Disinfection System – Eliminate Legionella and Scale & Sludge
  內置紫外光殺菌除垢系統- 清除退伍軍人桿菌和水垢
- Reduce the water pumping and chemical treatment requirements associated with cooling tower-refrigerant condenser system
  減少運水及化學物品的使用量
- Compare to Shell & Tube Condensers and cooling tower, about 15% energy consumption (water side) can be saved with built-in condensing water circulation system
  由於使用內置冷凝水泵,可節省約15% 運水能源
- Maintenance is easier and no down time required for annual cleaning
  維護保養容易年終清潔不用停機

## 10. Technical Parameter

| Technical Parameter | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ETCO Plate-Tube Evaporative Chiller - Scroll Compressor | | | | | | | | | |
| **Model:** | WLSZ | | 84CSG | 168CSG | 252CSG | 400CHG | 540CHG | 640CHG | 800CHG |
| **Unit Performance** | Cooling capacity | kW | 84 | 168 | 252 | 400 | 540 | 640 | 800 |
| | | Refri. Ton | 24 | 48 | 72 | 114 | 154 | 182 | 228 |
| | Overall system | SCOP | 4.54 | 4.6 | 4.58 | 4.6 | 4.7 | 4.6 | 4.6 |
| | Refrig. system Coefficeint of Preformance | COP | 5.28 | 5.02 | 4.99 | 5.08 | 5.33 | 5.04 | 5.08 |
| **Power Requirement** | Input power | kW | 18.5 | 36.5 | 55 | 87 | 115 | 139 | 174 |
| | Max op. amp. | A | 43 | 84 | 127 | 200 | 265 | 320 | 401 |
| | Refrigrant | R410A | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **System Description** | Refrig. circuit | Nos | 1 | 2 | 3 | 1 | 2 | 2 | 2 |
| | Compressor | Nos | 1 | 2 | 3 | 3 | 6 | 6 | 6 |
| | Compressor brand | | Danfoss | Danfoss | Danfoss | Danfoss | Danfoss | Danfoss | Danfoss |
| **Evaporator** | Type | | **Shell & Tube** | | | | | | |
| | Water flow | m3/h | 14 | 29 | 43 | 69 | 92.9 | 110 | 138 |
| | Water pressure drop | kPa | 70 | 70 | 70 | 70 | 70 | 70 | 70 |
| | Connection | mm | DN65 | DN80 | DN100 | DN125 | DN150 | DN200 | DN200 |
| **Condenser** | Type | | **Plate-tube Evaporative Condenser** | | | | | | |
| | Fan input power | kW | 1.5 | 1.5 | 3 | 6 | 9 | 9 | 12 |
| | Quantity of pumps | Nos. | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| | Pump input power | kW | 1.1 | 1.5 | 1.5 | 2.2 | 3 | 3 | 4.4 |
| | Exhaust fan | Pa | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| | Static pressure | | | | | | | | |
| | Water consumption | $m^3/h$ | 0.12 | 0.24 | 0.35 | 0.56 | 0.76 | 0.9 | 1.12 |
| | Drift Rate | % | **Less than 0.001% of Max. condensing water flow** | | | | | | |
| | | | **Statutory Requirment (EMSD) = 0.005% of Max. condensing water flow** | | | | | | |
| **Dimension** | Length | mm | 1750 | 2300 | 2300 | 3480 | 4910 | 5510 | 6540 |
| | Width | mm | 1630 | 1630 | 1850 | 2300 | 2300 | 2300 | 2300 |
| | Height | mm | 2600 | 3150 | 3150 | 3150 | 3150 | 3150 | 3150 |
| **Weight** | Shipping | kg | 1800 | 2750 | 3400 | 5700 | 8500 | 9000 | 11000 |
| | Operation | kg | 2100 | 3100 | 3800 | 6500 | 9500 | 10200 | 12600 |
| **Noise Level Reference** | @10 m | dB | 65 | 65 | 66 | 68 | 69 | 69 | 70 |
| | @1m | dB | 78 | 78 | 78 | 80 | 81 | 81 | 82 |

*ALL ABOVE SPECIFICATIONS ARE SUBJUST TO CHANGE FROM TO TIME WITHOUT NOTICE

## 11. Attachments 附件

### A1- Typical Job Reference
### 代表性的工作案例

**Hong Kong Water Supplies Department- Lung Cheung Road M&E Workshop**
**香港水務署位於龍翔道機電工場**


ETCO Chiller 2台共1040kW
03.2019

**Hong Kong KFC – To Kwa Wan Central Processing Plant**
**香港肯德基位於土瓜灣中央處理工場**


ETCO Chiller 5台共420kW
2020

**Beijing New Airport**

**北京大興新國際機場**


ETCO Chiller 8台共4800kW
06.2019

## Data Centre, GuangZhou

## 廣州南翔-雲數據中心










ETCO Chiller 17台共12120kW

2020

## A-2 Drift Rate Verification Report

# Report for the Verification for Drift Rate for ETCO Plate-tube Evaporative Condensed Chiller


2 ETCO Plate-tube Evaporative Condensed Chillers installed at Water Works Department's Maintenance Workshop in March 2019

Client : ECOOL AIR CO. LIMITED, ECOOL AIR PTY LTD & GUANGZHOU WIDE INDUSTRIAL CO. LTD. ( herein refer to ECA )

Verification Team : Ir Mai Kwok Wah, Mr George Yu & Michael Ho
Consultant Job period : 2nd March to 7th August 2019

Report prepared by : Michael Ho BEng, Project Manager

Approved by : George Yu
BEng, MHKAEE, MAEE, CAP, Certified Energy Manager, Partner

Verified by : Ir Mai Kwok Wah, Jenson 米國華工程師
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Date : 7/08/2019

## 1. Executive Summary

1.1 ECOOL AIR CO. LIMITED, ECOOL AIR PTY LTD & GUANGZHOU WIDE INDUSTRIAL CO. LTD. ( herein refer to ECA ) engaged our company in March to August 2019 to

A. Provide technical advice for the factory to prepare the drift emission test, conduct the drift test and onsite technical support during the drift test

B. Verify the test results

C. Publish the Report in the capacity as an independent Registered Professional Engineer, Registered Energy Accessor and Verifier

1.2 After our works, we can conclude that the ETCO Plate-tube Evaporative Condensed Chiller ( ETCO Chiller ) undergone the factory drift rate test comply with the relevant requirements in 3.6 Draft Eliminator - Code of Practice for Fresh Water Cooling Tower 2016 Edition – Part 1 : Design, Installation and Commission.

Paragraph 3.6 Drift Eliminator states the drift emission of the drift eliminator in the cooling tower should not exceeds **0.005%** ( Drift Emission Rate ) of the maximum design water circulation rate through the cooling tower.
We conclude that drift emission rate for the ETCO Chiller which undergone the drift emission test shows the Drift Emission Rate is **0.00042%.** Such a lower Rate is resulted from the integration for the unique total designs for the cooling system, the high COP performance and the innovative design and application of the plate-tube evaporative condensing.

1.3 The energy performance of a cooling tower should comply with the relevant requirements stipulated in the Code of Practice for Energy Efficiency of Building Services Installation (BEC) of Part 9 of the Buildings Energy Efficiency Ordinance (BEEO)

## 2. Description for ETCO Evaporative Condensed Chiller

Our Team conducted a detail examinations for the said Chiller during its production processes, final delivery test and drift emission test. In particular, we examined the circulation systems for both cooling water & air which are built inside the said Chiller.

Apart from the Product Brochure of the said Chiller listed in the reference list, the following Figure 1 shows the water & air cooling flow, mechanism and major parts for quick reference to the readers.

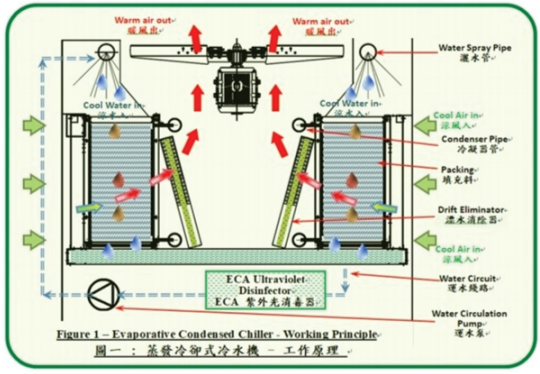


Figure 1 – Evaporative Condensed Chiller - Working Principle
圖一 ： 蒸發冷卻式冷水機 – 工作原理

## 3. Drift Emission Test

The test was conducted at the factory by the testing department on 13 June 2019 in accordance with 2 Chinese Standards, namely The Chiller Drift Emission no. JB/T 12323-2015 and The Standard of general machinery testing practice Ref no. JB/T 11530-2013

The drift emission rate Pr has its unit in kg of water per kwW.h
Pass rate = 0.035 Kg / Kw.h or lesser

Please refer to the Drift Emission Test Report dated 13 June 2019 – Para 8 for details.

The said Chiller undergone the drift emission test achieved the Drift Emission Rate of 0.0007 Kg / kW.h. In our opinion, such a low rate is very impressive and in particular reduces the circulation water consumption, energy usage and carbon emission.

**It is important to note that above drift emission rate which was obtained under the test in according to the Chinese Standard has been converted by our Team into the Drift Emission Rate of the Code of Practice for Fresh Water Cooling Tower 2016 Edition – Part 1 : Design, Installation and Commission ( 3.6 Draft Eliminator ) is 0.00042%**

## 4. Conclusion

We have pleasure to conclude that the ETCO Plate-tube Evaporative Condensed Chiller ( ETCO Chiller ) undergone the factory drift rate test comply with the relevant requirements in 3.6 Draft Eliminator - Code of Practice for Fresh Water Cooling Tower 2016 Edition – Part 1 : Design, Installation and Commission.

The impressive lower Drift Emission rate of **0.00042%** is so much lower than the 0.005% which is the required figure as stated in the Code of Practice. In our opinion, The said Chiller is not only in the top tier of both COP and energy efficient performance, its low water circulation consumption is one of the industry's best practices including more & better reduction in both water usage and carbon emission.

We are very pleased to have the opportunity to take part in this assignment. A note of thank to ECA management and all parties who supported the processes of our assignment.

Yours faithfully

Ir Mai Kwok Wah, Jenson
Mai EnviroEdu & Care Com Workshop

References attached :

- Fresh Water Cooling Towers Scheme 2016 Edition
- Code of Practice for Fresh Water Cooling Tower 2016 Edition – Part 1 : Design, Installation and Commission ( 3.6 Draft Eliminator )
- Code of Practice for Energy Efficiency of Building Services Installation (BEC) of Part 9 of the Buildings Energy Efficiency Ordinance (BEEO)
- Product Brochure of ETCO Plate-tube Evaporative Condensed Chiller
- The Chinese Standards, namely The Chiller Drift Emission Ref no. JB/T 12323-2015
- The Chinese Standard of general machinery testing practice Ref no.JB/T 11530-2013
- Isokinetic Drift Test Code, Cooling Technology Institute July 2011

End

## A3- 2018 Asia International Innovation Award





## A-4 Patents　專利

ETCO Patented Plate- tube Technology

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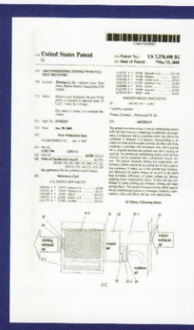
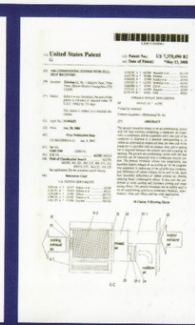


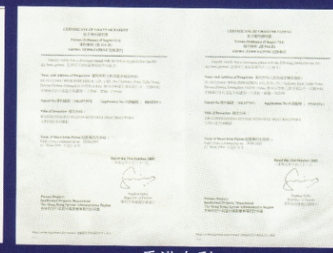
2007年美国发明专利

2008年 美国发明专利

日本专利


中国发明专利



香港专利


国内专利

# ECOOL AIR CO. LIMITED

## ETCO Plate-Tube Evaporative Condenser
## 板管蒸發冷卻式冷凝器


Address: Rm 1201, 12/F Chinachem Johnston Plaza,178 Johnston Road, Wanchai, Hong Kong
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Tel 電話: +852 - 6088 0661
Website 網址: www.ecoolair.com.hk
Email 電郵: plho@ecoolair.com.au


Standard of Chiller is JB/T 12323-2015

Australia I Hong Kong I Macau

Rev.202101B