高效綠能技術
Efficient Green Technology

PES TOPWELL
www.topwell-pes.com


Taiwan · 台灣廠


China · 中國廠

Efficient Green Technology

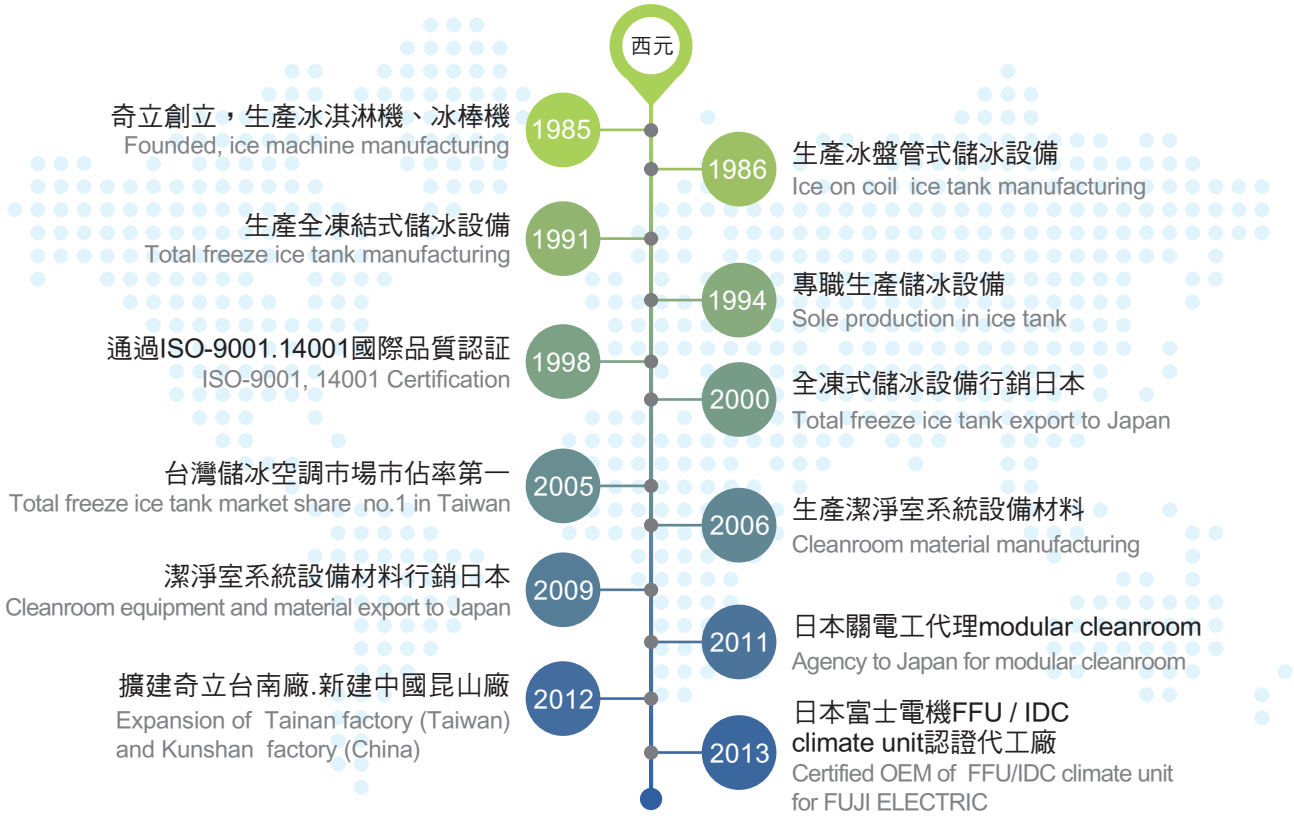
高效綠能技術（Efficient Green Technology）是指節省能源消耗、提昇能源使用效率、促使能源的回收再應用、減少污染、治理污染，或改善生態的技術體系。高效綠能技術與現代科技緊密相連，高新技術勢必將走向 [綠化、無公害化] 的道路，今天一些高新技術的應用，也正在破壞我們賴以生存的這個環境，因此身為地球村的科技者，必須開發具持續性、高效智能化的全新技術，走向對環境保護較有利的道路（或至少無害）。

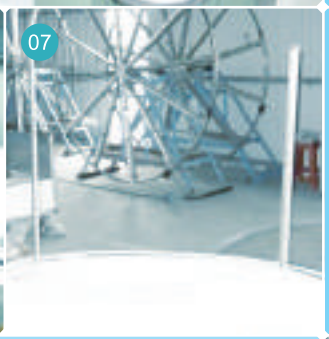
奇立實業自我定位為高效綠能技術（Efficient Green Technology）產品的生產供應廠家，我們將常年在空調及潔淨室領域所發展的系統節能技術，與自製的高效率風扇、DC馬達的生產技術，結合智能化的控制系統，將其應用到CLEAN ROOM AC/DC-FFU、IDC CLIMATE UNIT、HVAC DC-FCU、儲冰槽等產品的開發工程上，將跨領域的技術加以整合應用，除了可強化既有產品的價值外，並將產生新的節能價值要素，這些高效智能化的高效綠能技術（Efficient Green Technology），使原產品產生「質」的變化，令其具備更強大、更周延的能力，可輔助改善人類永續發展的需求，成為一種友善環境的新技術，在如今越來越生態和技術導向的社會，高效綠能技術（Efficient Green Technology）對於奇立實業具有重大的發展意義。

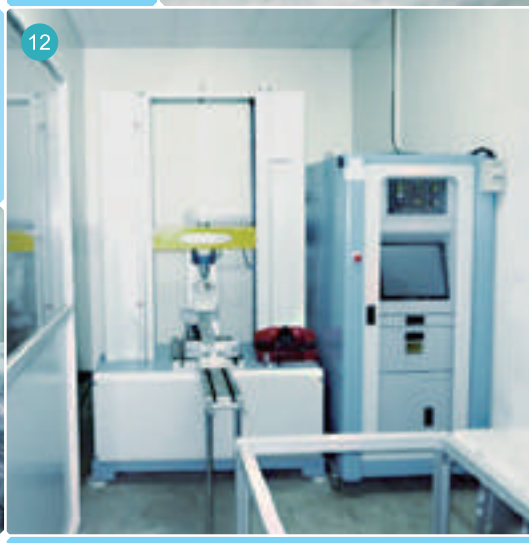
Efficient Green Technology is aimed to conserve energy, increase energy efficiency and enable energy recycle, which consequently results in pollution reduction and ecosystem improvement. Efficient Green technology is closely connected to modern technology, the direction of green and contamination free is inevitable. For any who involve technology development, it is our responsibility to develop sustainable, high efficient and intelligent technology to benefit the protection of our environment.

Chyi Lee is positioned as supplier of Efficient Green Technology products. Based on years of experience of energy saving in HVAC and Cleanroom application, we adopt the intelligent control system, in addition to the high efficiency of motor and fan design, to develop a series of products including cleanroom AC/DC FFU, IDC Climate Unit, DC FCU and thermal storage. The integrated technology not only enhances the existing product value but also creates the new value of energy conservation. The intelligent technology elaborates the “quality” of product and is in capable of improving the environment with sustainable development.

Top Well 事記沿革







01 02 03 AC/DC馬達生產線
AC/DC Motor Production Line

04 馬達性能品檢室
Motor Characteristics Inspection Room

05 06 CNC板件加工生產線
CNC Sheet Metal Fabrication Line

07 08 儲冰槽生產線
Ice Tank Production Line

09 FFU生產線
FFU Assembly Line

10 FFU 全檢測試儀
FFU Final Inspection Machine

11 FFU動平衡測試機
Motor/Fan Balancing Machine

12 潔淨室材料破壞測試機
Material Strength Test Machine

13 FFU 風洞測試機台
FFU Air Dynamic Test Chamber

14 FFU 電力性能檢測
FFU Electrical Characteristics Test

15 噪音振動測試室
Anechoic Chamber

16 控制機板性能耐久測試室
FFU Controller Reliability Test

17 FFU風扇馬達耐久測試室
FFU Motor/Fan Reliability Test

潔淨室風機濾網機組 Clean Room - Fan Filter Unit

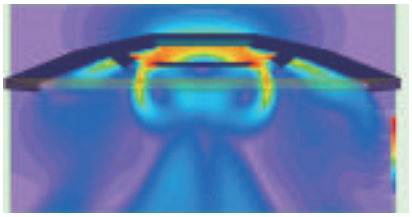
TOPWELL累積30年的潔淨室工程經驗，結合台灣高科技電子產業技術，及傑出的軟體技術人才，並應用台灣企業優良的加工技術與品質，生產出優於國際品牌的新一代高效率風機濾網機組。讓我們從台灣開始，使全世界都看得到TAIWAN-FFU。

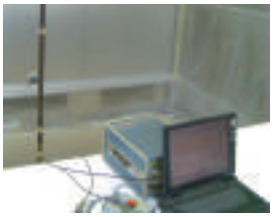
TOPWELL , accumulated 30 years of service in cleanroom construction, developed the new generation of high efficiency Fan Filter Unit, in synergy of Taiwan hi-tech electronic technology and HMI software development, manufactured under the reliable quality in Taiwan.

研發與測試 Research And Development

藉由3D 氣流模擬軟體，研發最佳氣流場的箱體結構，可降低風道擾流，提升風機效率，促使風量風佈均勻。

FFU casing is designed, via air flow simulation software, to ensure the efficiency and flow distribution.



產品經專業研究機構的測試與驗證，確保研發數據的正確性，提升產品的效率及品質。

FFU performance is tested and verified by third party lab or research institute.

MIT台灣設計製造的高品質高效率控制基板 High Efficiency Design Of FFU Controller

控制機板由國際大廠在台灣投資設立的專業製造廠商開發生產，產品符合EMC、SEMI 相關規範或標準。控制基板內建諧波抑制器，有效降低用戶端的干擾。

FFU controller is designed by Taiwan professional company, which is invested by international well known company, and is manufactured in Taiwan. The controller is tested to meet the EMC and SEMI standards and the harmonic filter is built-in to minimize the interference of power source.

DC控制基板
BLDC motor controller

AC控制基板
AC motor controller

高效率高品質馬達 High Efficiency Motor

高效率直流無刷馬達，機電效率高達90% 以上，軸心與軸承處，具抗電蝕(Current Burn) 設計，軸承設計使用年限可達100,000 小時。

The external rotor DC brushless motor is designed to achieve over 90% of efficiency, and the shaft/bearing is prevented from electrical pitting to assure the bearing life of 100,000 hours.

風扇特性分析 Fan Features

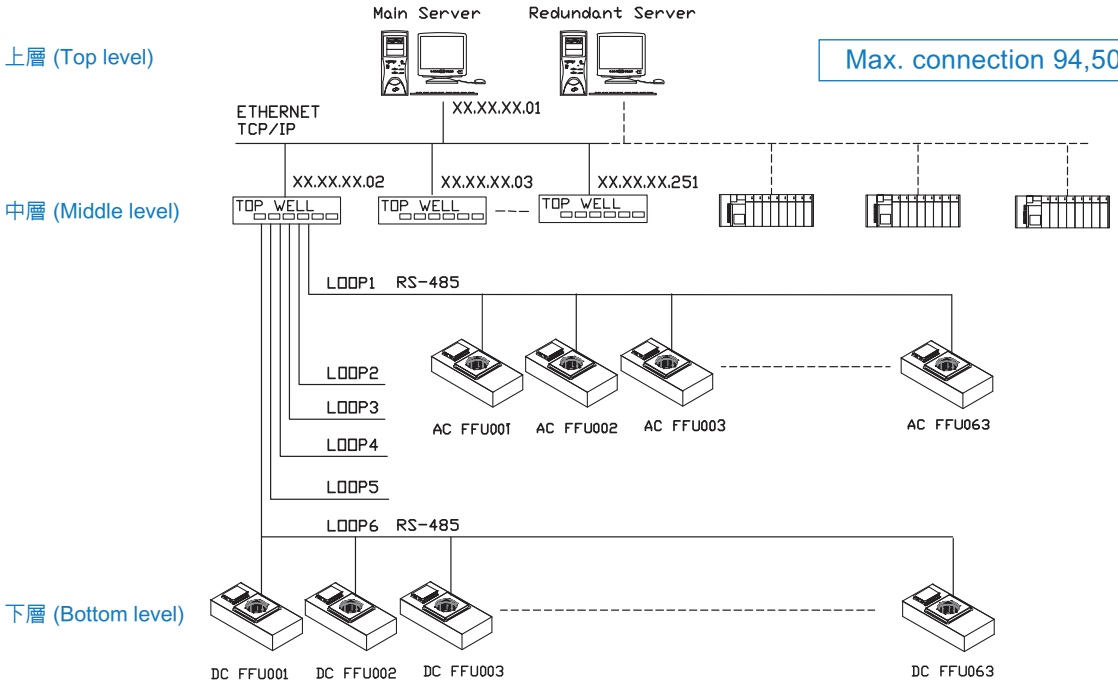
65%高靜壓效率，多種不同特性葉輪的組合應用，達成高效率低噪音的使用目標。

65% of static pressure efficiency AC/DC motor controller. Aerofoil or centrifugal fan is selected to meet the application requirement.

3D葉片風輪
Aerofoil fan

多翼式葉片風輪
Centrifugal fan

FFU監控系統架構 FFU System

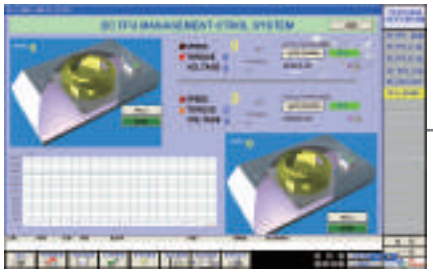


註：本系統之FFU控制器為監控通訊版，另有非監控版控制器提供單機手動調速及警報乾接點功能。

Note:For AC FFU, the non-communication type, which is equipped only with manual control and alarm dry contact, is also available.

主要控制功能 Monitoring And Control Function

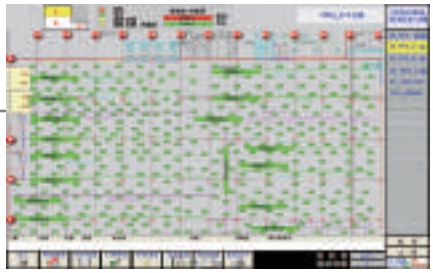
- 單機控制 Individual control
- 群組迴路控制 Group control
- 控制中心集體控制 Control Centre by Server
- 現場直接控制 Local Control by Local Clients
- 遠端連線控制 Remote Control by Internet
- 跨平台整合能力 OPC service
- 工控系統直接整合 HMI ex:Intouch,IFIX



單機運轉資料顯示
Individual control mode

多機群控顯示，點擊圖示單元可顯示單機運轉資料。
Group control mode

中文INTOUCH 圖控軟體，與廠務監控系統整合容易。
INTOUCH software applicable for the monitoring and control system, enable the integration to FMS

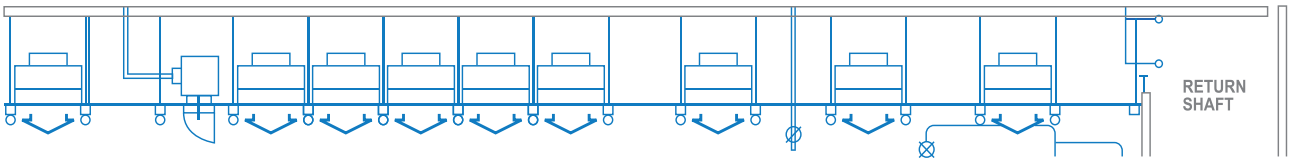


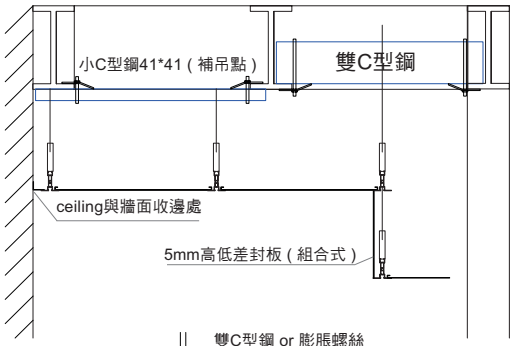
可將CAD圖面直接轉為圖控劃面
Display is easily converted from CAD drawing

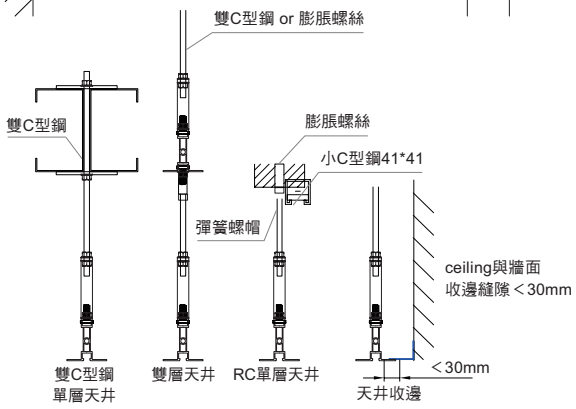
圖控系統的軟體編輯及試機調整，Topwell 100% 完全自主處理，可於24小時內完成業主的變更需求。

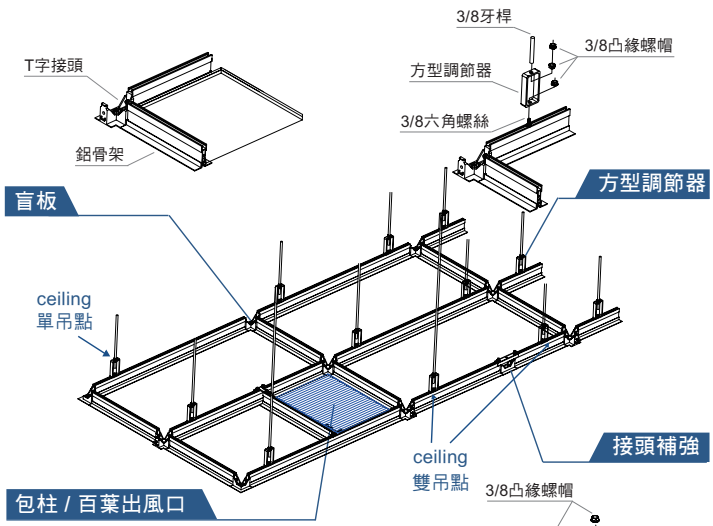
Testing, commissioning and maintenance service fully local supported.

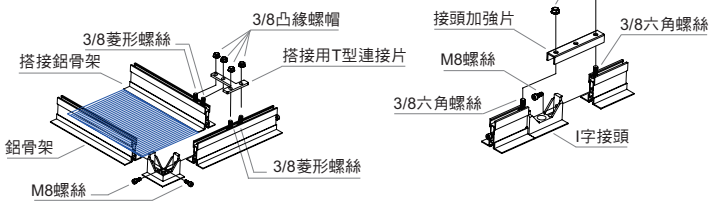
潔淨室天花板整合系統 Clean Room - Ceiling Integration System











二次鋼構之強度及撓度評估報告 Hanging Structure Strength Design Calculation

條件設定

梁縱向跨度 L	360cm（360 ~ 720）
梁橫向間距 S	240cm（75~240）
吊點間距 D	120cm（60 , 75, 120）
均佈靜載重	0.0056kgf/cm2
均佈活載重	0.0049kgf/cm2
楊氏係數 E	2040000kgf/cm2
鋼料種類	SS400
容許撓度(活載)	cm
(總載)	cm

鋼材性能		
容許應力強度	長期應力(kgf/cm2)	短期應力(kgf/cm2)
張應力強度	fac=1500	fat=2000
剪應力強度	fsc=1000	fst=1333
壓應力強度	fcc=1500	fct=2000
撓曲應力強度	fbc=1500	fbt=2000

吊點		
編號	位置	
i	Case2 Di (cm)	Case1 Di (cm)
1	120	60
2	240	180
3		300

斷面性能	
使用斷面類型	2（1=C形；2=雙C形；3=U形；4=雙U形；5=RH型；6=I型；7=槽鋼）
使用斷面名稱	125X50X20X2.3
總斷面積 A	11.5cm2
剪力斷面積 Av	5.75cm2
斷面模數 S	43.8cm3
慣性矩 I	274cm4
每根二次鋼構最大吊點數n	3

強度檢核

靜載重 P=161.28kgf			
剪力強度 case1 控制	最大剪力 V=P*n/2=241.92kgf 平均剪應力 τ=V / Av=42.07kgf/cm2	≦1000	OK
撓曲強度 case1 控制	最大撓曲彎矩 ΣMi= = 24192.00 kgf-cm 最大撓曲應力 σ= = 552.33 kgf/cm2	≦1500	OK
跨度中央撓度 case1 控制	撓度 δc= =0.551 cm		

活載重 P=141.12kgf			
剪力強度 case1 控制	最大剪力 V=P*n/2=211.68kgf 平均剪應力 τ=V / Av=36.81kgf/cm2	≦1333	OK
撓曲強度 case1 控制	最大撓曲彎矩 ΣMi= =21168.00 kgf-cm 最大撓曲應力 σ= =483.29 kgf/cm2	≦2000	OK
跨度中央撓度 case1 控制	撓度 δc= =0482 cm	≦1.000 (L/360)	OK

靜+活載重 P=302.40kgf			
剪力強度 case1 控制	最大剪力 V=P*n/2=453.60kgf 平均剪應力 τ=V / Av=78.89kgf/cm2	≦1333	OK
撓曲強度 case1 控制	最大撓曲彎矩 ΣMi= =45360.00 kgf-cm 最大撓曲應力 σ= =1035.62 kgf/cm2	≦2000	OK
跨度中央撓度 case1 控制	撓度 δc= =1.032 cm	≦1.500 (L/240)	OK

天花板斜拉桿及桿棹之強度及撓度評估報告 Seismic Bracing Structure Strength Design Calculation

基本資料

垂直吊桿間距	X向間距 Ax= 1.5 m Y向間距 Ay= 1.5 m
斜拉桿間距(垂直吊桿倍數)	X向間距 Bx= 3 ×Ax= 4.5 m Y向間距 By= 2 ×Ay= 3 m
斜拉桿傾斜度	水平距離 Lx= 3 m 垂直距離 Lz= 1 m
設備地震強度 (unit: kgf-cm)	工址地區：1 (1= 一般與近斷層地區；2=台北盆地) 測試案例：新竹市香山區 (不適用於台北盆地) 新竹市：SDS= 0.7 hx= 10 m ap= 1 Rpa= 2 香山區：Ip= 1.5 hn= 25 m Rp= 2.5

材料、斷面及載重(鋼料種類：SS400 、鋼料楊氏系數Es：2040000kgf/cm2)

鋼材性能		
容許應力強度	長期應力(kgf/cm2)	短期應力(kgf/cm2)
張應力強度	fac=1600	fat=2400
剪應力強度	fsc=924	fst=1386
壓應力強度	fcc=1600	fct=2400
撓曲應力強度	fbc=1600	fbt=2400
降伏強度	fy=2500	

吊桿性能(有螺紋)		
	正常情況下(kgf/cm2)	地震作用下(kgf/cm2)
張應力強度	tb=1200	tb=1800
剪應力強度	qb=924	qb=1386

斷面性能	
吊桿種類=1 (1：實心鋼棒、2：空心鋼管)	
吊桿尺寸	D=13mmΦ
直徑	db=1.27cm
斷面積	As=1.267cm2
迴轉半徑	r=0.3175cm
斜拉桿尺寸	D=10Φ
直徑	db=0.95cm
斷面積	As=0.713cm2
迴轉半徑	0.2375cm

模組式潔淨室 Modular Cleanroom

具備溫濕度、風量、潔淨度自我調控能力的模組式潔淨室。
Modular cleanroom with automatic control of temperature/humidity, air flow and cleanness.

- 溫濕度、燈光、插座、網路等自動控制已完備，且可聯線中控室，設備定位完成，接水接電即可運轉。
  Equipped with lighting, receptacle, LAN cable and temperature /humidity control system, which can be connected to central control system for remote monitor /control.The operation of cleanroom is immediately available upon completion of unit and hook up of utilities.

- 潔淨等級變更、潔淨室面積增減、遷移回收應用容易。
  Easy for cleanness up-grade, cleanroom modification or re-location.

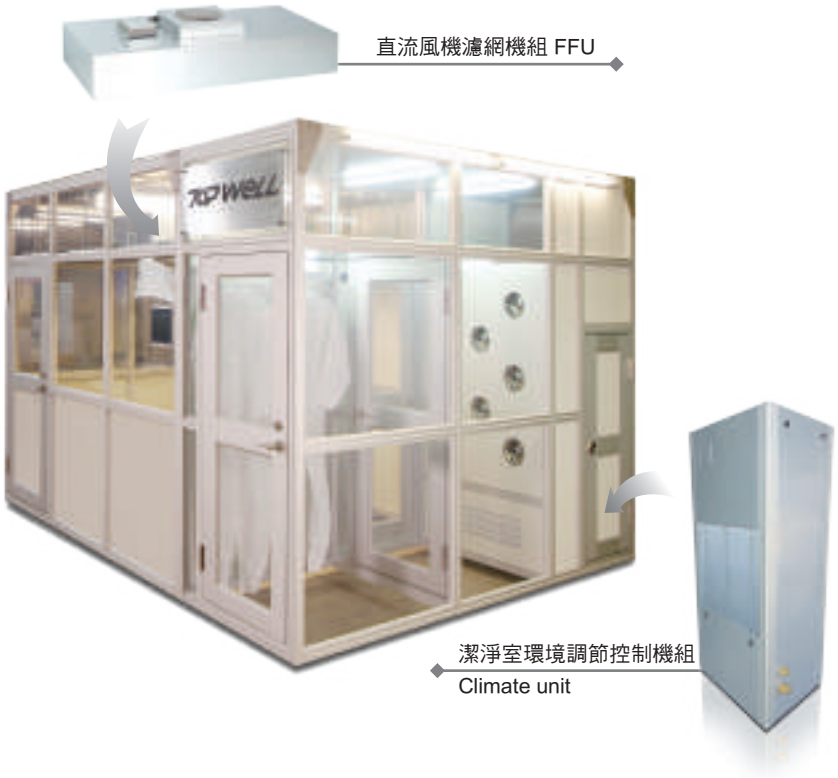
- 工程技術已整合，技術層次降低，客戶可自行設計規劃應用。
  Engineering integration for easy and flexible application.

- 全系統設備供應服務climate unit、ceiling grid、tool partition、ffu、燈具、外氣預冷空調箱等，均為TOPWELL產品，採購便利成本低，工程界面責任明確。
  Consisting of climate unit, ceiling grid, tool partition, FFU, lighting and PAH, which are TOPWELL developed products for assurance of quality and cost control.

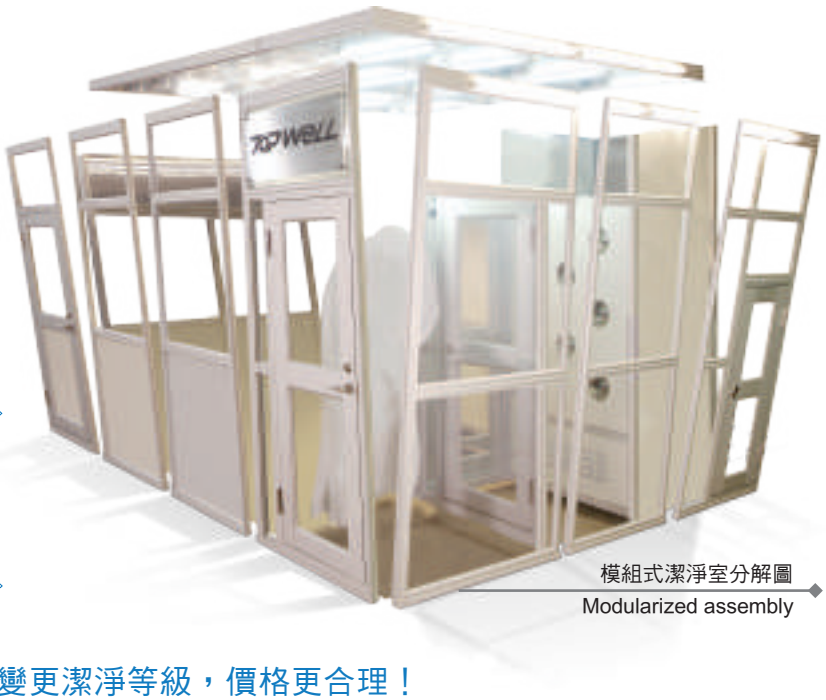
- 氣冷室外機或冷卻水塔散熱均可，即使pcw或冰水也行(控制閥自動調整水量)。
  Cooling can be outdoor air cooled or water cooled by cooling tower, also the PCW or chilled water is applicable for cooling source (a control valve is installed for automatic adjustment of flow rate).

- 多項節能設計，常時運轉不浪費電能。
  Energy saving design is considered to assure the most efficient running cost.

- 更衣室、風淋室、機械室完備，實驗室可自主操作使用。
  Equipped with gowning room, air shower and machine room, providing the cleanroom with protocol function.



接水接電即可運轉
Immediate operation upon utilities hook-up



無塵無菌室隔間牆面可擴充、可變更潔淨等級，價格更合理！
Room partition is removable for space extension and the cleanroom cleanliness is easy to upgrade to offer best cost performance.

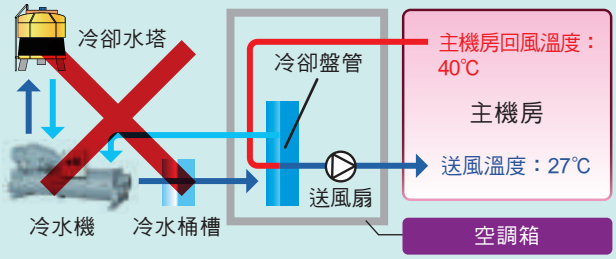
IDC機房系統工程 Internet Data Center Integration System

- 積極活用外氣能源，高顯熱變頻機組，實現省能空調 COP = 10 、PUE = 1.2X。
  Utilization of free cooling and high efficiency inverter controlled compressor to achieve the system cop=10 and the PUE=1.2X.
- 間接外氣冷卻方式，防止屋外塵埃、濕度、氣體腐食因子的破壞干擾。
  Indirect cooling arrangement to prevent the contamination and the corrosion from outside air.
- 空調系統無須冷卻水及補給水源，實現省能環保空調 WUE = 0。
  Elimination the usage of cooling water or chilled water to achieve the water conservation WUE=0.
- 只要有電力即可運轉，沒有無水停機的問題。
  Operation is simply powered by electricity, the limitation from water shortage is eliminated.
- 不需要冰水機及冷卻水冰水管配置
  Elimination of chiller and complicated piping work.

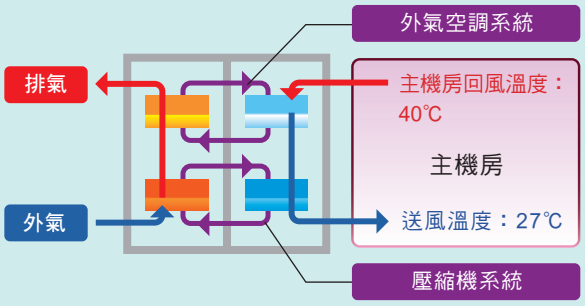
各地平均氣溫與PUE試算結果（SA26℃、RA40℃（ΔT＝14℃））

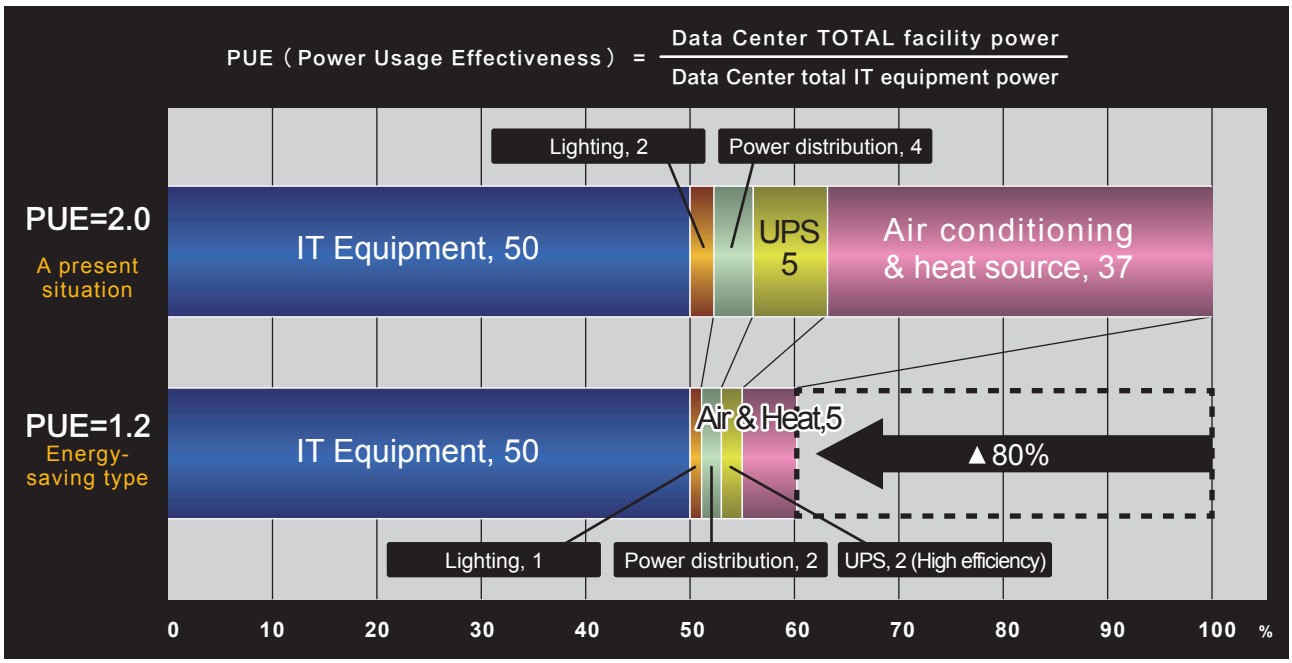
	北京		台北		東京	
月	月平均溫度〔℃〕	PUE	月平均溫度〔℃〕	PUE	月平均溫度〔℃〕	PUE
01	-3.1	1.05	15.8	1.20	5.1	1.06
02	0.2	1.05	15.9	1.20	7.0	1.06
03	6.7	1.06	18.0	1.21	8.1	1.06
04	14.8	1.12	21.7	1.23	14.5	1.12
05	20.8	1.18	24.7	1.25	18.5	1.15
06	24.9	1.25	27.4	1.27	22.8	1.22
07	26.7	1.29	29.2	1.28	27.3	1.31
08	25.5	1.27	28.8	1.28	27.5	1.31
09	20.7	1.18	27.1	1.26	25.1	1.26
10	13.7	1.12	24.3	1.25	19.5	1.16
11	5.0	1.06	20.9	1.22	14.9	1.12
12	-0.9	1.05	17.6	1.20	7.5	1.06
年間平均	12.92	1.14	22.62	1.24	16.48	1.16

A：一般空調系統（冰水機＋空調箱）Traditional HVAC System（Chiller+AHU）



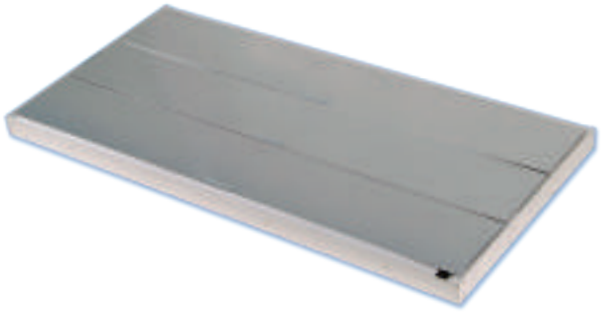
B：間接外氣空調系統 Indirect Outside Air Cooling System

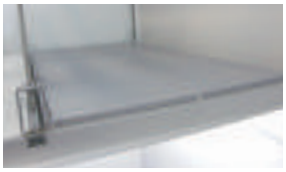


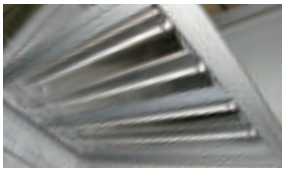


潔淨室系統設備材料 Clean Room System Equipment & Material

潔淨室專用防塵燈具 Clean Room Recessed Lighting Unit



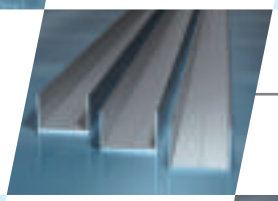




- 高發光效率 76.9 lm/w。
  76.9 lm/w of high luminous effciency.
- 上掀箱蓋 維護更換燈管部落塵。
  Top maintenance.
- 鋁合金框架箱體質輕易安裝，可降低天花板系統荷重。
  Light weight of aluminum casing for easy installation.
- 超薄平整，人員可行走踩踏。
  Thin and flush casing for walkable desigh.
- 效率提升5%。
  High luminous efficiency.
- 重量減輕25%。
  Less weight.（２５% less than steel casing）

鋁複合材隔間材 Tool Partition - Aluminum Profiles

40x40 三向鋁立柱
40x40 3-way Aluminum Frame



鋁軌
Aluminum Rail

40x40 雙向鋁立柱
40x40 2-way Aluminum Frame

鋁槽蓋
Aluminum Rail Cover

40x40 四向鋁立柱
40x40 4-way Aluminum Frame

40x40 鋁橫柱
40x40 Horizontal Aluminum Frame

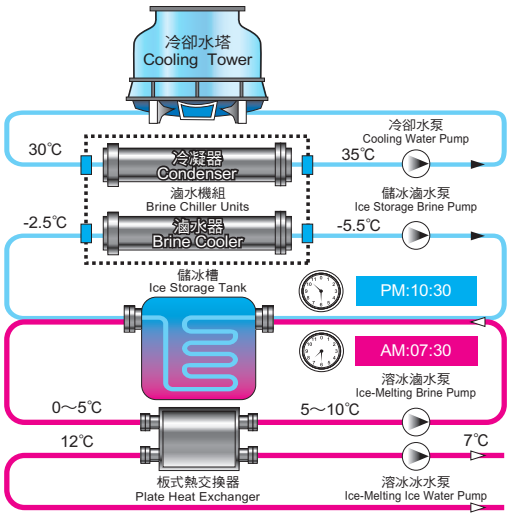
儲冰式空調系統 Total Freeze Ice Tank

儲冰式空調系統 Ice Storage Cooling System

電價最便宜之夜間離峰時段，啟動滷水機組及儲冰滷水泵製冰（藍線流程），節省流動電費。白天使用冷氣時段時，僅需啟動溶冰滷水泵（紅線流程）即可達到空調使用目的，兼具轉移白天契約電力，降低基本電費的功能。若將溶冰泵接續緊急發電機電源，白天即使停電，仍可供應冷源。

Operate the brine units and ice storage brine water pump to for ice making (blue line processes) during the off-peak electricity consuming period-the cheapest electric price period to save running cost.

When air conditioning at day time , it is only need to operate the ice-melting brine (red line processes) for cooling the so as to transfer the day time electricity consumption to night time and save the demand chare If the ice - melting pump is connected to emergency generator , the cooling function can be continuous even the power is in failure.



儲冰式空調系統的特點 Function Of Ice Storage System

■ 轉移尖峰用電

利用夜間或非尖峰時段運轉主機儲冰，轉移白天或尖峰時段之用電量，具有平衡電力負載之功能。

The ice making chiller is operated in the night time or off-peak hours so that the energy consumption in the day time or peak hours is shifted and reduced.

■ 節約基本電費及新設線路補助費

例如某工廠，生產設備用電100KW，空調尖峰用電100KW，若採傳統空調冰水機組，則其申請的電力契約容量為100KW+100KW=200KW。若使用儲冰空調，因運轉時間措開，故當生產設備用電停止使用後，其電力轉移供主機運轉儲冰，因此基本電費之契約容量仍然為100KW。

For instance, for a factory, the energy consumption is 100KW each for production equipment and for peak load of air conditioning. If traditional chilled water system is used, the total demand charge of 200KW shall be applied. By application of ice storage system, the energy consumption of ice making chiller is shifted to night time while production equipment is not operating, and the demand charge can be minimized to 100KW.

■ 節約流動電費

利用二段式或三段式時間電價，享受電費差價措施。儲冰系統之離峰電價另打六折計收。

Under the bi-zone or the tri-zone electrical rate, the running cost can be saved at the off-peak rate. The additional 25% discount of non-peak hour is applied for ice storage system (in Taiwan).

■ 降低主機容量

傳統空調系統，冰水主機之容量選定都是以尖峰負荷為依據，但是實際上尖峰負荷全年不超過六十天，主機絕大部份時間是在部份負荷下運轉。在春秋季節時，負荷可能更低至50%以下，造成主機投資的浪費。採用儲冰系統可拉長主機運轉時數，大幅降低主機容量。例如：某空調負載每小時需求200噸，從早上8：00～17：00共9小時，全部空調負荷為200噸×9小時＝1800噸／時，若將主機運轉時間延長為15小時，則主機能力可降為120噸（1800噸／時÷15小時），因儲冰機效率較低，故需選擇150噸級。若同案例採行傳統空調，則主機必需配置200噸級。

For traditional air conditioning system, the cooling capacity is decided according to peak cooling load. However, the required period for peak load is limited to certain time period only, and the chiller is operating at less capacity in most time of the year. Especially in Spring and Fall seasons, the cooling load is reduced to less than 50% of capacity, which means the initial investment of chiller is partially wasted. By application of ice storage system, the chiller can be operated for the extended hours at the lower capacity.

For example, a cooling load of 200RT/hr is required for 9 hours, from 08:00 to 17:00, the total cooling capacity is 200RTx9HR. If the operation hours are extended to 15 hours, the chiller capacity will be reduced to 120RT (1800RT-HR÷15HR). As the efficiency of ice storage system is lower, the 150RT of cooling capacity shall be selected for the chiller, in comparison to 200RT chiller for traditional chiller system.

■ 高運轉效率

主機滿載運轉至儲冰完成，機組完全在100%容量狀況下運轉，避免卸載運轉時的效率損失（傳統機組當容量卸載至50%時，其耗電仍高達75%）。

During ice making process, the chiller is running at full capacity so as to avoid the less efficiency of operation at lower capacity. (Generally, for traditional system, even under operation of 50% load, the energy consumption is still up to75% of full load consumption).

■ 具擴充功能

在機組能力不變的情況下，只要將運轉時數拉長，即可增加空調能力，彈性運用自如。

Additional cooling capacity can be achieved by simply extending the operation hours without investment of new equipment.

■ 低溫冰水供應

可提供低溫冰水，供冷藏、低溫除濕及製程冷卻系統使用。同時在相同室溫條件下，可減少供風量及水量，降低風車馬力35%，並可減少水泵耗電25%，同時可減少工程費用。

The ice storage system supply chilled water for refrigeration, dehumidification and process cooling. Due to the lower temperature, the volume of supply air and supply water can be reduced, so that the capacity of fan and pump can be reduced accordingly. As a result, the energy consumption and the initial investment can be minimized as well. (the fan capacity can be reduced upto 35%, the water pump power consumption can be 25% less).

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安裝範例 Installation Example

戶外直接埋設

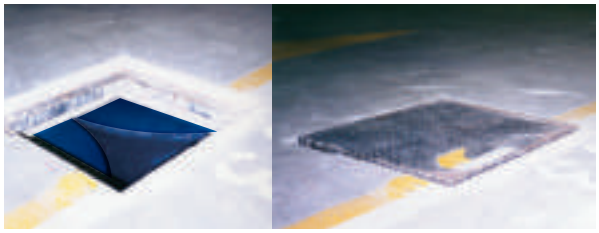
戶外直接埋設示意圖
Simulation diagram

戶外地下室按裝

戶外地下室按裝示意圖
Simulation diagram

建築筏基槽按裝方式一

建築筏基槽按裝示意圖
Simulation diagram



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