KLEAN AIR

儲冰空調系統

Ice Storage A/C System

全凍結式動態儲冰槽

Ice storage tank - with water circulation

QUALITY ASSURED FIRM ISO 9001 SGS

ENVIRONMENTAL SYSTEM ISO 14001 SGS

OCCUPATIONAL HEALTH & SAFETY OHSAS 18001 SGS

何謂儲冰式空調系統
Introduction of ice storage air conditioning system

儲冰式空調系統是利用夜間離峰用電時間運轉冷凍壓縮機製冷。當壓縮機運轉，鹵水溫度低於 0℃時儲槽容器內的水產生相變化而結成冰以儲存大量潛熱，在於日間尖峰用電時間將儲存的冰融解釋出冷能提供空調負荷需求以達到減少運轉壓縮機的目的，如此將空調用電由尖峰時間移到離峰時間不但可降低尖峰用電，減少電力契約容量同時享受離峰用電優惠電價以節省電費。

儲冰式空調系統可分為全量儲存與分量儲存兩種儲冰模式，以一典型辦公大樓為例，其空調負荷分佈如圖 1。夏季設計日空調尖峰負荷為 1000RT，空調時間為上午 8 時至下午 5 時，全日空調總負荷為 7500 RT-Hr。分量儲冰空調負荷分佈如圖 2，冷凍壓縮機連續運轉，日間提供部分空調負荷，不足之量則由夜間運轉儲冰彌補，由於運轉時間延長，空調負荷分配於全日 24 小時，故平均負荷僅為 312.5RT（僅為原來的 31.25%），儲冰容量僅供彌補日間之不足，故儲冰容量亦相對減少，此種儲冰模式所需投資費用最省。

全量儲冰之空調負荷分佈如圖 3，冷凍壓縮機僅在夜間（或離峰時間）運轉儲存足夠容量，日間空調負荷需求時壓縮機停止運轉，負荷完全由儲冰量供應，系統僅必要之泵、風扇運轉即可，則壓縮機儲冰運轉平均負荷容量可減少至 500RT（為原來的 50%），由於空調負荷完全由儲冰量供應，故需較大的儲冰容量，投資費用也較分量儲存模式高，但全量儲存對減少尖峰時間契約用電量最顯著，若配合採用離峰電價則可節省之電費最可觀。

應如何選擇分量或全量儲存最為有利端看建築物使用功能特性、空調負荷分佈情形及電費計價結構而異，並無定論，故欲正確選擇必須先予以評估計算。與傳統空調系統比較，儲冰系統可減少壓縮機、泵及冷卻水塔等設備容量，但須增加儲冰設備及儲槽費用，若儲冰費用高於減少的設備容量費用則須依賴電費節省以達到經濟效益。在某些情況下如適當利用建築物筏式基礎作儲冰槽，則僅增加儲冰介質費用，此時儲冰系統投資費用甚至可望低於傳統空調系統。

The ice storage system is running refrigerating compressor with off-peak power in the night, and waters will be froze to store plenty latent heat by phase change while the temperature of brine is lower than 0℃ during charging periods, and then discharge to reduce load profile of on-peak air conditioning during the day. It is not only reduced on-peak and contracted demand but also save electric charge by preferential rates if shifted on-peak load profile to off-peak periods.

Ice storage system can be subdivided into full and partial storage mode. For example, figure 1 illustrates the cooling load profile of typical office building. The on-peak cooling load is 1000RT on the design day in summer. The period of air conditioning is from A.M 8:00 to P.M. 5:00, and total cooling loads are 7500 RT-Hr. Figure 2 illustrates the cooling load profile of partial storage. The compressor is continue running to meet the portion of air conditioning load on the design day; when the load exceeds the chiller capacity, the additional requirement is discharged from off-peak storage. Because of the running time is extended and dealt out cooling loads to 24hours, the average capacities are only 312.5RT (31.25% of original capacity). The on-peak deficit will be offset by discharge; the capacity of ice storage is reduce relatively. The investment of this mode would save money best.

Figure 3 illustrates the cooling load profile of full storage. A chiller designed for full storage typically operates at full capacity during all off-peak hours on the design day. The equipment does not run except pump and fan for air conditioning during on-peak hours, and all cooling loads are met from storage. The average capacity of loads that running for charge is downsized to 500 RT (50% of original capacity). Because of all cooling loads are met from off-peak storage, so the larger ice storage is necessary and investment is more than partial mode. But full storage can reduce off-peak demand charge undeniably, and save power charge by off-peak rate.

There is no final conclusion that how to determine partial or full storage is advantageous to air conditioning system. Calculation and verification is necessary before certain choice, and it must consider that usage character of building, distribution of air conditioning load and electric rates.

Compressor, pump and cooling tower in the ice storage system compare downsize with traditional air conditioning system, but add ice storage tanks and facilities are necessary. It’ s necessary to save electric charge for economic benefits if added cost can’ t cover with the decrease by downsized. Maybe the initial cost of ice storage system lower than traditional because added cost is only the material charge of ice storage if the mat foundations of building are applied as ice storage tank in certain condition.

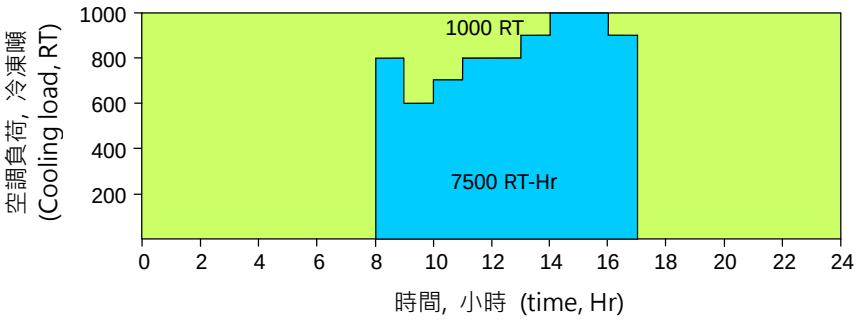


圖 1(Fig. 1)
一般辦公大樓空調負荷分佈
(the cooling load profile of typical office building)

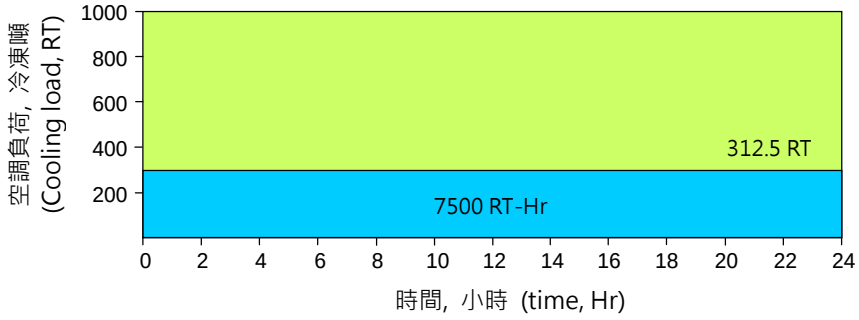


圖 2(Fig. 2)
分量儲冰空調負荷分佈
(the cooling load profile of partial storage)

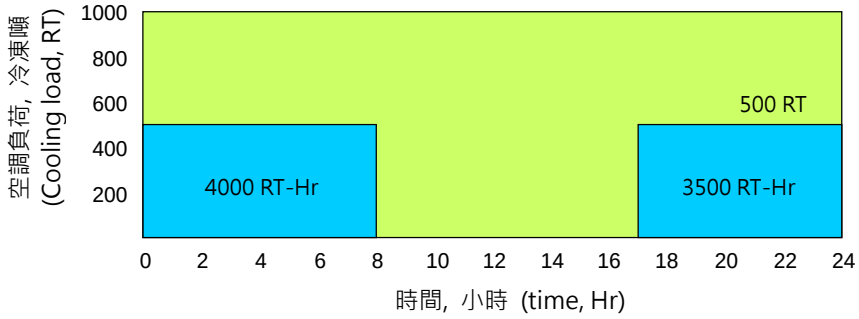


圖 3(Fig. 3)
全量儲冰空調負荷分佈
(the cooling load profile of full storage)

儲冰空調系統設備容量選定
Determine the facilities capacity of ice storage air conditioning system

一、全量儲存(Full storage)

1、冰水機容量(capacity of chiller units)

$$CAP = \frac{CL \times (1+HL\%)}{D\% \times OH_C}$$

2、儲冰容量(capacity of ice storage)

$$ICE = CL \times (1+HL\%)$$

二、分量儲存(partial storage)

1、冰水機容量(capacity of chiller units)

$$CAP = \frac{CL \times (1+HL\%)}{D\% \times OH_C + OH_d}$$

2、儲冰容量(capacity of ice storage)

$$ICE = (CAP \times D\% \times OH_c) \times (1+HL\%)$$

CAP：冰水主機額定容量，噸 (rated capacity of chiller unit, Ton)

CL：設計全日空調總負荷，噸·小時 (total cooling load of design day, Ton-Hr)

HL%：儲冰槽及冰水傳送熱損失，一般以 5%計。 (heat transfer loss of tank and piping. In general, it' s about 5%.)

D%：冰水機儲冰對額定容量比，依冰水機型式、性能及儲冰溫度而定，一般在 60~75%之間。 (The ratio of charging over rated capacity of chiller unit, it depends on chiller type, performance and charging temperature. In general, the ratio is between 60% and 75%.)

OH_c：儲冰運轉時間，小時 (ice charging time, Hr)

OH_d：融冰空調運轉時間，小時 (ice discharging time, Hr)

ICE：儲冰容量，噸·小時 (ice storage capacity, Ton-Hr)

動態儲冰槽應用於儲冰系統之優點
Advantage of dynamic ice storage tank apply to ice storage system

一、熱交換面積大儲冰率高

聚乙烯(Polyethylene, PE)儲冰盤管，緊密排列，熱交換面積大，配合儲冰加速泵，儲冰效率高。

二、溶冰速率快

PE 儲冰盤管中冰水對流熱傳，可達到快速與完全溶冰效果。本儲冰槽設計上亦可冰水、鹵水雙向進行溶冰，效率加倍，解決一般塑膠類盤管之儲冰槽溶冰效率不良之缺點。

三、結冰率大

動態儲冰槽盤管排列整齊，結冰率(Ice packing factor, IPF)高達 70%以上。

四、安裝空間最省

動態儲冰槽 IPF 高，故儲冰槽所需空間小，長方型或圓筒型規格儲冰槽定型排列，空間利用性高，所需空間最節省，約 4.8 ~ 5.5 m^3/100RT-Hr，比一般容器式儲冰槽節省 30~40%空間。

五、系統設計簡單方便

規格化定型儲冰槽，密閉式鹵水系統，儲冰系統設計最簡便。

六、適用於各類型儲冰主機

動態儲冰槽儲冰效率高，可適用於各類型儲冰主機，如螺旋式、離心式、往復式或渦卷式儲冰主機。

七、鹵水需用量最少

動態儲冰槽使用之鹵水為 25%之乙二醇(Ethylene glycol, EG)水溶液，鹵水循環於儲冰管內，水結冰於管外，所需之鹵水量最少，平均小於 1.5 kg EG/RT-Hr。

八、不銹鋼槽體耐用性高

不銹鋼槽體，提供長期使用，安全可靠，最符合經濟效益。

九、保溫性強，減少熱損失

配合高溼度氣候條件，動態儲冰槽加強保溫厚度，減少槽體結露滴水現象，並可減少儲冰熱損失，節約能源。

1. The large heat exchange area brings high ice storage efficiency

PE(Polyethylene) ice storage tubes are compact and formed large heat exchange area to bring high ice storage efficiency with accelerative charge pump.

2. Rapid discharging

Chilled water is working by convective heat exchange when crossing PE ice storage tubes, so the ice will melt rapidly and completely. The ice storage tank has been designed to two-way melting ice by chilled water and brine, so the melt efficiency has been increased to improve the disadvantage of melting slowly for plastic tubes.

3. High ice packing factor

Heat exchange tubes are regular arranged in the dynamic ice storage tank, so the ice packing factor (IPF) will gain over 70%.

4. Save install space

Because the dynamic ice storage tank kept high IPF, so the required area for is minimum. The normalized rectangular or circular storage tanks can be arranged regularly to save space. It require about 4.8 ~ 5.5 m^3/100RT-Hr, and has saved by 30~40% as compared with general vessel tank.

5. System is simple for easy design

The ice storage system is simple for easy design due to the normalized and shaped tank within close brine circulating system.

6. Apply to various brine chillers

The dynamic ice storage tank kept high efficiency and it suitable for various brine chillers like as screw, centrifugal, reciprocating or scroll type.

7. Required quantity of brine is minimum.

The 25% EG (ethylene glycol) solution has been selected as working brine for the dynamic ice storage tank. Brine is circulating in the heat exchange tubes and ice brought around outside. The required quantity of brine is minimum, and the average value less than 1.5 kg EG/RT-Hr.

8. Durable stainless steel tank

Stainless steel tank not only keep long-term usage, safe and stable operation but also conform to the economic benefits.

9. Good insulation to reduce heat loss

The thickness of insulation of dynamic ice storage tank has been increased to fit the high humid climate, and will reduce dew and heat loss to save energy.

十、適用冷風供應系統

動態儲冰槽溶冰速度快，可提供 3~5℃低溫冰水，適合應用於冷風供應系統，節省冰水流量，降低 20%水泵馬力，減少送風量，縮減風管管徑，縮小空調機房，增加建築樓板面積等多項優點。

10. Apply to the cold air supply system

The dynamic ice storage tank kept rapid ice melting, and it suitable for cold air supply system by supplying 3~5℃ chilled water. The advantages of this system include save 20% horsepower of pump, and reduce chilled water flow rate, airflow rate, and the diameter of duct and the size of equipment room to increase area of floor.

動態儲冰槽原理
Principle of dynamic ice storage tank

一、對流熱傳優於傳導熱傳

動態儲冰槽係基於對流熱傳優於傳導熱傳原理，將盤管間以隔板隔成數空間室，再配以一小型循環水泵將水導流而上下循環於各隔板間室，如此可以利用最小的動力泵（每槽約 1~2 HP）構成一動態冰水循環水流，儲冰時管內鹵水與管外冰水間形成對流傳熱，故結冰效果提升。本動態儲冰槽在溶冰過程由於循環水流攪動使鹵水與冰水間的靜止水層流動起來，而突破阻隔，對於溶冰效果具相當助益，使儲冰槽儲冷容量完全發揮。以上為本動態儲冰槽基本原理，亦為其優異之特點。

一般儲冰槽在盤管內側循環鹵水，盤管外儲水結冰於管壁，由於靜止儲冰與鹵水熱交換為傳導熱傳模式，因此儲冰效率不佳。在溶冰初期，鹵水管與結冰間管壁冰迅速溶冰成水後逐漸形成鹵水與冰間的靜止水層，成為熱阻抗而使溶冰效率減緩，甚至在溶冰末期雖有剩餘冰量，卻無法使用的現象。

二、雙向溶冰速率加倍

動態儲冰槽的另一個特點是在溶冰行程可以利用冰水回水動力替代冰水循環泵，使冰水可由外而內直接溶冰供應空調，再配合鹵水自內而外將結冰管溶冰，形成雙向溶冰故效率加倍。

1. **Convective heat exchange is better than conduction**

The dynamic ice storage tank is based on the theory that the convective heat exchange is better than conduction. The tank has been divided to several chambers by partition and the small circular pump guide water flow through every chamber up and down circularly, thus the dynamic circulating chilled water flow may arise from minimum power pump (about 1~2 HP per tank), and then the flow generating the convective heat exchange between inner brine and outer chilled water to raise the freezing effect in charging process. The circulating water flow will agitate steady water layer between brine and chilled water to break resistance in the discharge process of tank. This result will improve discharge effect and exert storage energy in the tank completely. For the description given above, it’ s not only the basic theory but also advantage of dynamic ice storage tank.

In general, brine is circulating in the tube and storage water will be frozen on the outer. Because of the heat exchange between still ice and brine is conduction, so that effect of ice charge is poor. In the beginning of discharge, the ice where near the wall of tube is melting rapidly and then generate still water layer as thermal resistance to reduce discharge effect between brine and ice. To make matters worse, the remanent ice can’ t be melting in the final of discharge process.

2.Two-way melting ice caused double effect.

The returning chilled water caused power to substitute for the circulating pump is the other character of dynamic ice storage tank. The chilled water melts ice in the outside and brine in the inside concurrently, two-way melting ice will cause double effect.

動態儲冰槽儲冰與融冰說明
Introduction of charge and discharge of dynamic ice storage tank

一、儲冰行程(charging cycle)

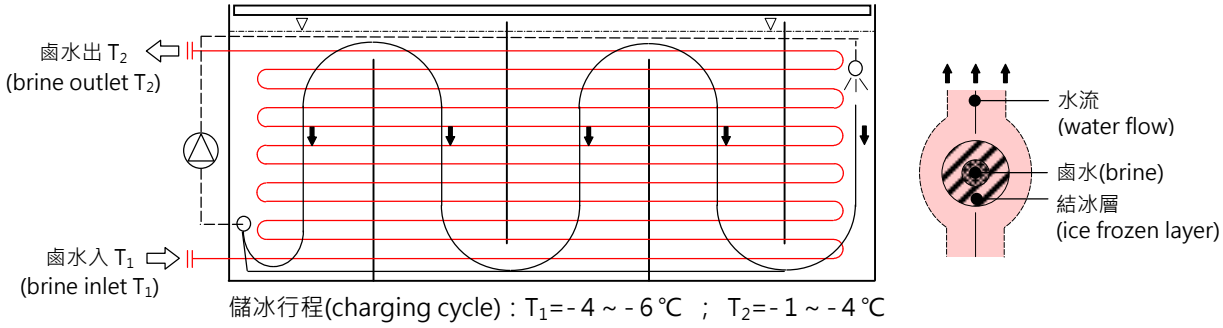


圖 4、儲冰行程 (Fig. 4、charging cycle)

二、融冰行程(discharging cycle)

1、單向融冰(single-way discharging)

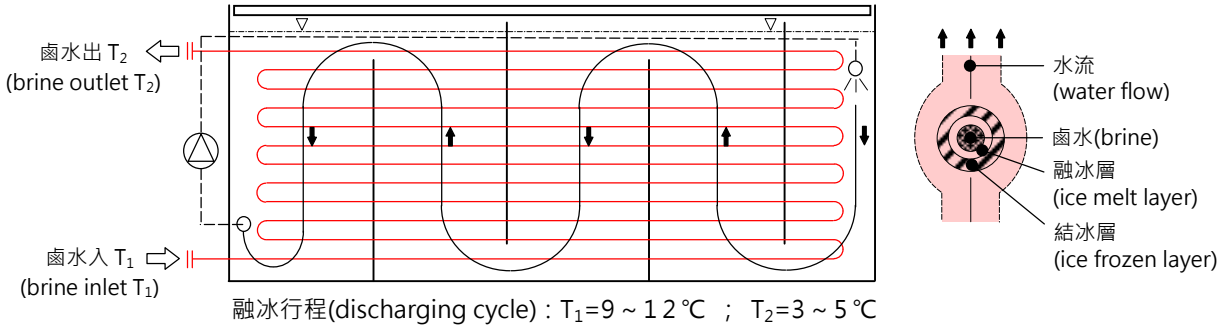


圖 5、單向融冰行程 (Fig. 5、single-way discharging cycle)

2、雙向融冰(two-way discharging)

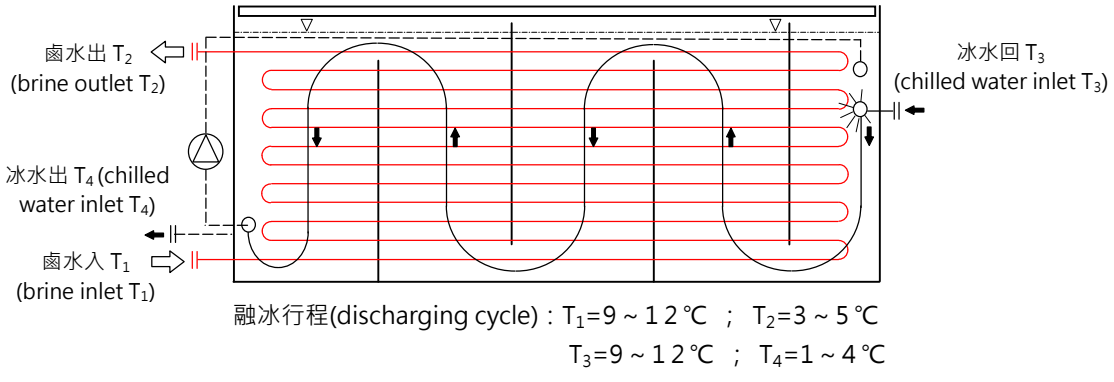


圖 6、雙向融冰行程 (Fig. 6、two-way discharging cycle)

系統流程說明
Introduction of the system flow diagram

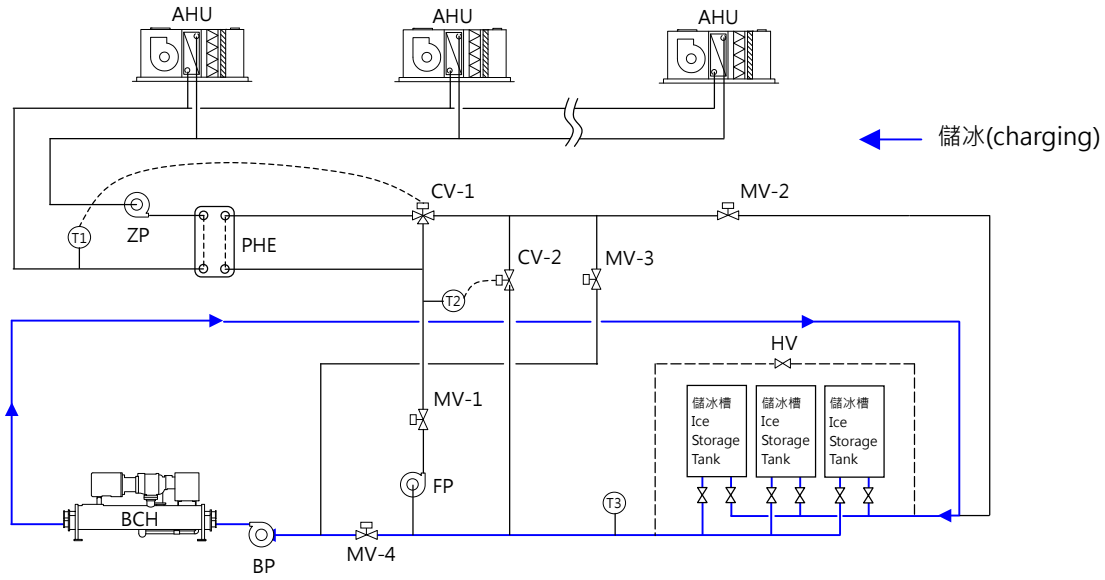


圖 7、儲冰行程系統流程 (Fig. 7、flow sheet of charging cycle)

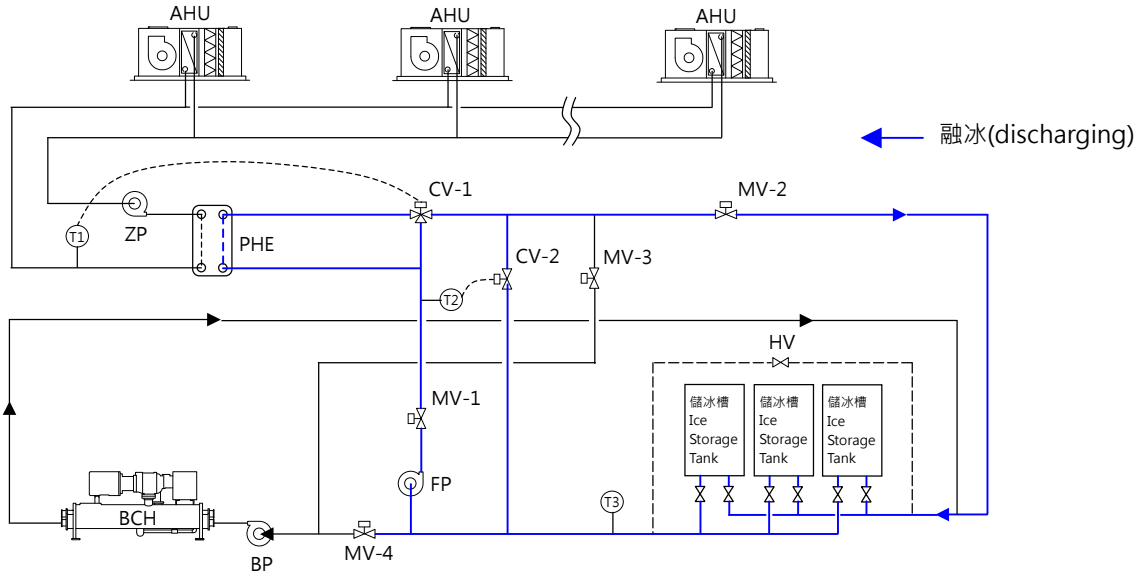


圖 8、融冰行程系統流程 (Fig. 8、flow sheet of discharging cycle)

設備 (facility) / 行程 (process)	儲冰主機 (chiller unit) BCH	儲冰泵 (charging pump) BP	融冰泵 (discharging pump) FP	冰水泵 (chilled water pump) ZP	電動閥 (modulating valve) MV-1	電動閥 (modulating valve) MV-2	電動閥 (modulating valve) MV-3	電動閥 (modulating valve) MV-4	旁通閥 (by-pass valve) HV
儲冰行程 (charging cycle)	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF
融冰行程 (discharging cycle)	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF
主機直接供應空調不經儲冰槽(chilling by chiller unit only)	ON	ON	ON	ON	ON	OFF	ON	OFF	ON

系統流程說明
Introduction of the system flow diagram

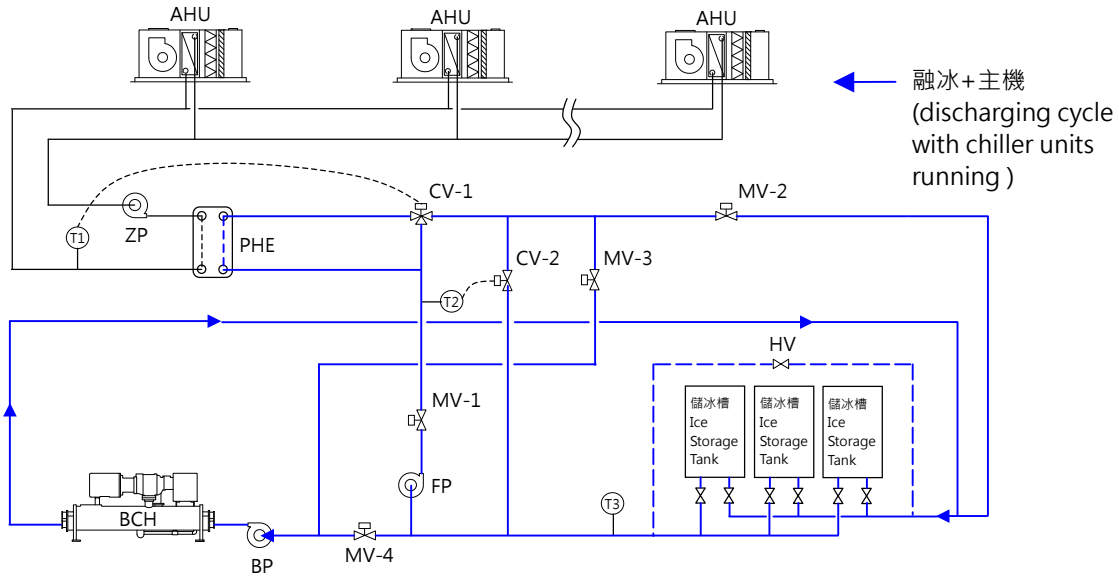


圖 9、融冰行程+主機輔助系統流程
(Fig. 9、flow sheet of discharging cycle with running chiller unit)

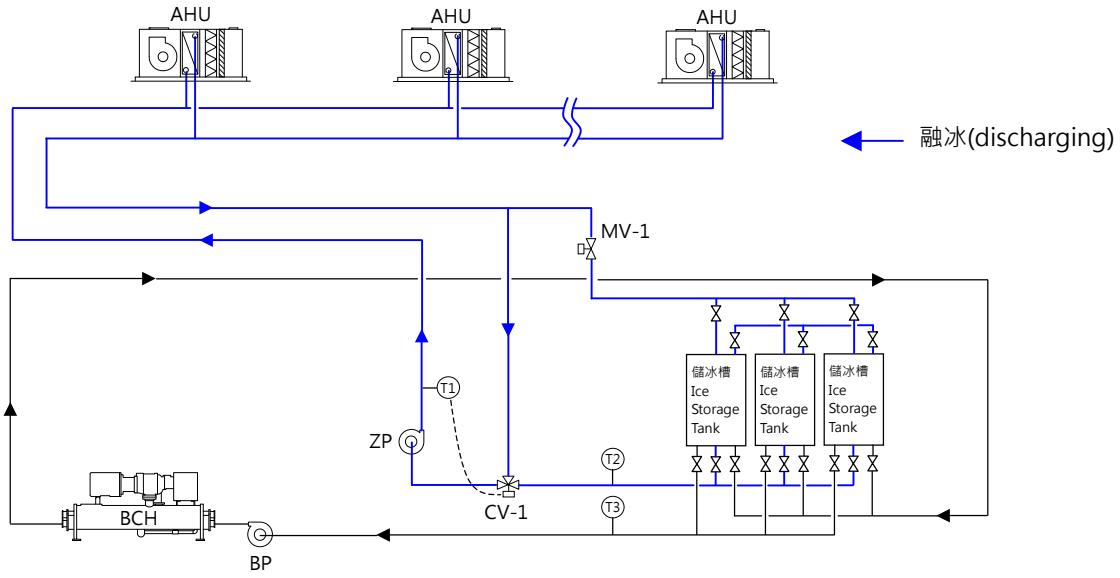
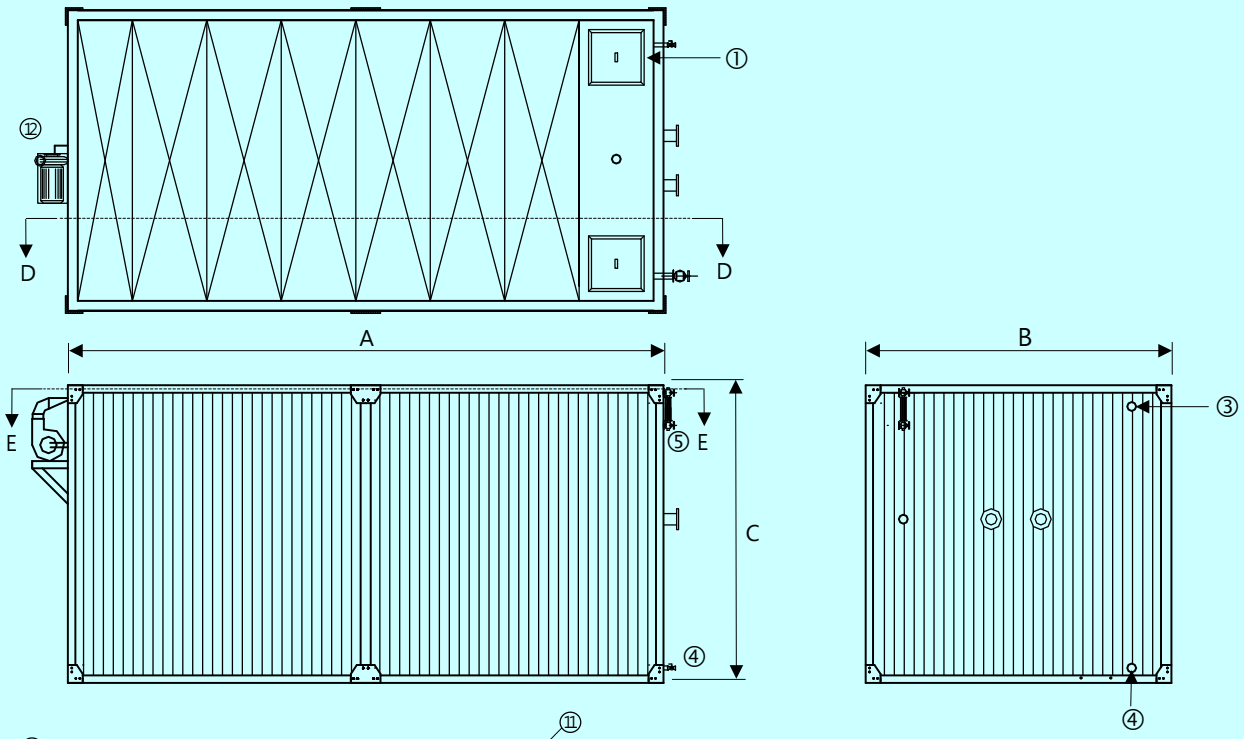
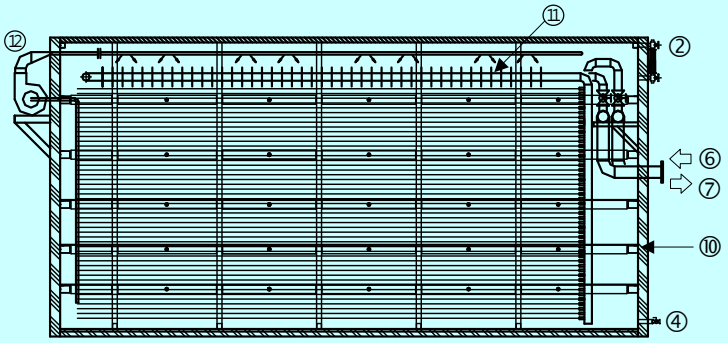


圖 10、融冰行程冰水直接供應空調系統流程
(Fig. 10、flow sheet of discharging cycle with supply chilled water directly)

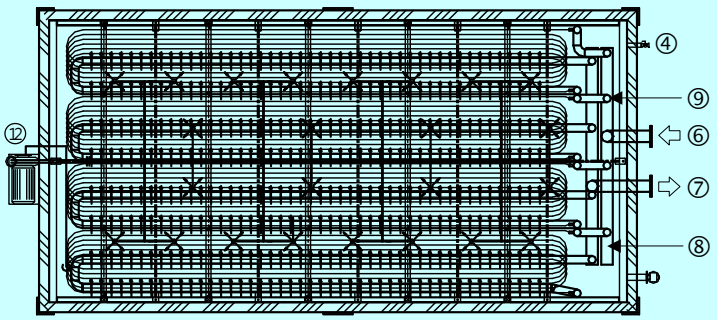
設備 (facility) / 融冰行程 (discharging process)	儲冰主機 (chiller unit) BCH	儲冰泵 (charging pump) BP	融冰泵 (discharging pump) FP	冰水泵 (chilled water pump) ZP	電動閥 (modulating valve) MV-1	電動閥 (modulating valve) MV-2	電動閥 (modulating valve) MV-3	電動閥 (modulating valve) MV-4	旁通閥 (by-pass valve) HV
儲冰+主機(charging cycle with chiller units running)	ON	ON	ON	ON	ON	ON	ON	ON	OFF
融冰行程冰水直接供應 (discharging by supply chilled water directly)	OFF	OFF	---	ON	ON	---	---	---	---

長方形儲冰槽構造及外型尺寸
The frame and outline dimensions of rectangular ice storage tank





D-D 剖面圖 (D-D sectional view)



E-E 剖面圖 (E-E sectional view)

說明(descriptions)：
①人孔蓋(manhole cover)
②儲冰容量顯示計(ice charged indicator)
③清水加水口(fresh water make-up joint)
④排水孔(drain)
⑤保溫蓋板(insulated cover plate)
⑥鹵水入口(brine inlet)
⑦鹵水出口(brine outlet)
⑧主分佈管(main distributive pipe)
⑨支分佈管(branch distributing pipe)
⑩槽體及保溫材(shell and isolated materials)
⑪再冷卻盤管(選配)(Re-cool coil by optional)
⑫冰水循環泵(選配) (chilled water circulating pump by optional)

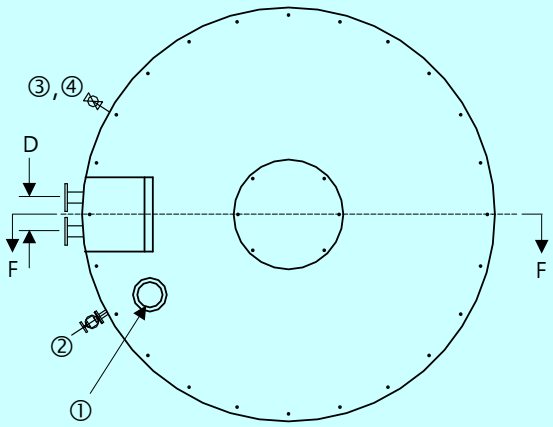
本儲槽專利號碼：第 134956 號
Patent’ s number: No.134956 (Taiwan)

儲冰槽外型尺寸(The outline dimension of ice storage tank)　　單位(unit)：mm

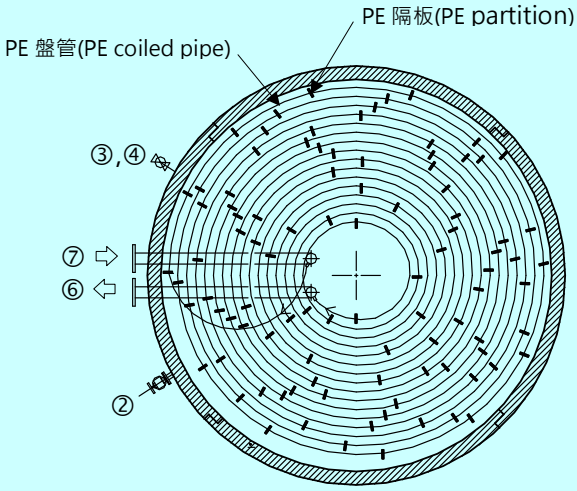
型號(model)	A	B	C	⑥	⑦
Dyn 335	3950	2200	2050	80A (3B)	80A (3B)
Dyn 425	4950	2200	2050	80 A (3B)	80 A (3B)
Dyn 500	4950	2200	2400	100 A (4B)	100 A (4B)
Dyn 560	5550	2200	2400	100 A (4B)	100 A (4B)
Dyn 610	5950	2200	2400	100 A (4B)	100 A (4B)
Dyn 900	6600	2500	2800	125 A (5B)	125 A (5B)

備註(Remark)：製作尺寸以承認圖為準。(The dimension for fabricating according to approved drawing finally.)

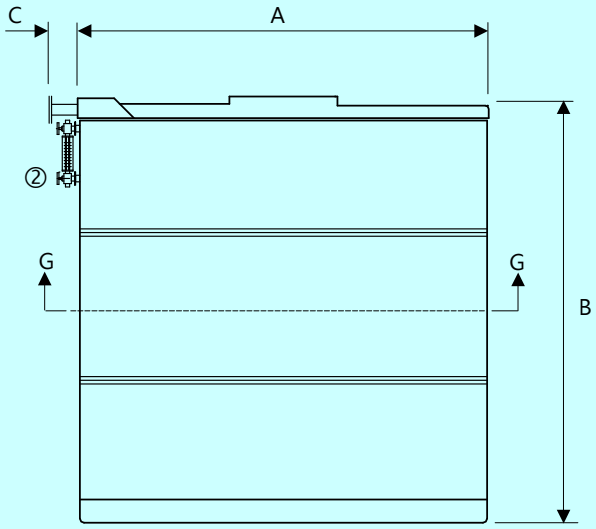
圓桶形儲冰槽構造及外型尺寸
The frame and outline dimensions of circular ice storage tank



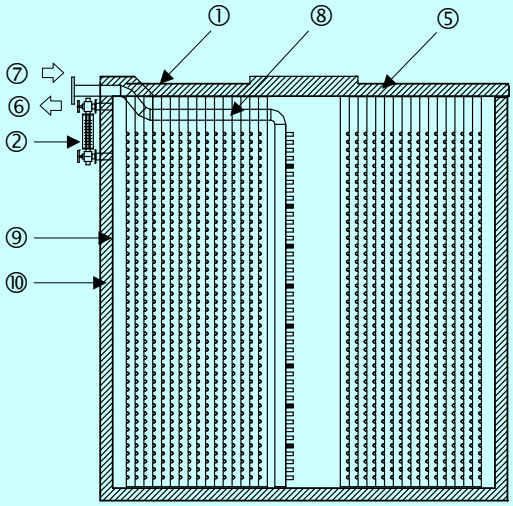
上視圖 (top view)



G-G 剖面圖(G-G sectional view)



側視圖 (side view)



F-F 剖面圖 (F-F sectional view)

說明(description)：

①手孔(hand hole)
②儲冰容量顯示計(ice charged indicator)
③清水加水口(fresh water make-up joint)
④排水孔(drain)
⑤FRP 上蓋板(FRP top plate)
⑥鹵水入口(brine inlet)
⑦鹵水出口(brine outlet)
⑧主管及支分佈管(main and branch distributive pipe)
⑨槽體 (shell of tank)
⑩保溫材(isolated materials)

儲冰槽外型尺寸(The outline dimension of ice storage tank)　　單位(unit)：mm

型號(model)	A	B	C	D	⑥	⑦
Dyn 160	2450	1950	100	300	50A (2B)	50A (2B)
Dyn 175	2180	2550	100	300	50A (2B)	50A (2B)
Dyn 200	2320	2550	100	300	65A (2-1/2B)	65A (2-1/2B)
Dyn 225	2450	2550	100	300	65A (2-1/2B)	65A (2-1/2B)
Dyn 260	2450	2950	100	300	65A (2-1/2B)	65A (2-1/2B)

備註(Remark)：製作尺寸以承認圖為準。(The dimension for fabricating according to approved drawing finally.)

長方形儲冰槽規格表
Specifications of rectangular ice storage tank

形式 (model)		單位	Dyn-335	Dyn-425	Dyn-500	Dyn-560	Dyn-610	Dyn-900
能力 (capacity)	儲冰能力 (ice storage capacity)	Ton-Hr	335	425	500	560	610	900
		kW-h	1178	1494	1758	1969	2145	3165
	顯熱(sensible heat)	kW-h	177	224	257	295	355	524
	潛熱(latent heat)	kW-h	1001	1270	1501	1674	1790	2641
外型尺寸 (dimension)	寬(width)	mm	2200	2200	2200	2200	2200	2500
	高(height)	mm	2050	2050	2400	2400	2400	2800
	長(length)	mm	3950	4950	4950	5550	5950	6600
材質 (material)	槽體(shell of tank)	N/A	SUS 304 不銹鋼板 (SUS 304 Stainless steel plate)					
	主分佈管 (main distributive pipe)	N/A	SUS 304 不銹鋼管 (SUS 304 Stainless steel pipe)					
	隔板(partition)	N/A	耐低溫 PE 隔板 (freeze-resisting PE Plate)					
	結冰盤管(ice coil)	N/A	16mm 耐低溫 PE 管 (16 mm freeze-resisting PE pipe)					
保溫 (insulation)	上蓋板(top cover plate)	N/A	50mm PU 發泡保溫庫板 (50mm isolated plate of PU formed)					
	四周及底板 (side & bottom plate)	N/A	外保溫 厚度 100mm (100mm thickness isolation)					
鹵水(brine)	濃度(concentration)	N/A	25%	25%	25%	25%	25%	25%
	容量(volume)	liter	690	880	1050	1200	1320	1880
熱交換管路 (HX tubing)	迴路(circulating pass)	N/A	3	3 or 4	3 or 4	4	4	4 or 5
	循環水量(water flow rate)	LPM	450	560	680	760	820	1200
	壓降 (pressure drop)	M	8.4	8.8 or 6.6	9.8 or 8.4	7.4	8.8	9.8 or 8.4
接管 (connection)	鹵水出入口 (brine inlet/outlet)	inch	3" × 3"	3" × 3"	4" × 4"	4" × 4"	4" × 4"	5" × 5"
	冰水出入口 (water inlet/outlet)	inch	3" × 3"	3" × 3"	4" × 4"	4" × 4"	4" × 4"	5" × 5"
重量 (weight)	淨重(shipping weight)	kg	1450	1860	2080	2360	2560	3540
	運轉重量 (operating weight)	kg	16250	21540	23750	26680	28980	42450
操作壓力(operating pressure)			max 8.8 bar (125 psi)					
測試壓力(tested pressure)			12.2 bar (175 psi)					
操作溫度範圍(operating temp. range)			-15 ℃ ~ 50 ℃ (-5°F ~120°F)					
循環水泵(選配) (circulating pump by optional)			1 HP	1 HP	1 HP	2 HP	2 HP	2 HP
儲冰容量顯示計(ice capacity indicator)			0 ~ 100% 刻度 (scale)					
儲冰容量感測計(選配) (ice capacity sensor by optional)			4~20 mA output (option)					

備註(Remark)：

(1)標準型接口管為側出，但可依客戶需求改為上出。
The outlet of connection is side type, but top is available customize.

(2)以上儲冰槽為標準規格，歡迎訂製其他規格儲冰槽或配合現場製作。
As table described above, tanks are standard specification. Welcome to order special specifications or local fabrication

(3)循環冰水泵為選項配備，採 3PH/60Hz/220V 或 380V 通用型馬達，如採用其他電源請於訂購前告知。
The circulating chilled water pump with 3PH/60Hz/220V or 380V motor is optional facility, and please contact with us if special power source required.

(4)儲冰容量計算依據 ARI Standard 900-1998。
Net usable ice storage capacity was calculated according to the ARI Standard 900-1998.

(5)以上規格若有變更恕不另行通知。
Specifications are subject to change without notice for further improvement.

應用實例
Application examples

儲冰槽吊裝
Hanging the ice storage tank

儲冰槽配置
Local layout of ice storage tanks

儲冰槽分佈管
Distributive pipes of ice storage tanks

儲冰槽盤管佈置
Coils layout of ice storage tank

結冰前(before freeze)

結冰後(ice froze)

儲冰槽盤管結冰前液位 0 %
The liquid level of the ice storage tank is equal 0% before charge.

儲冰槽儲冰完成液位 100 %
The liquid level of the ice storage tank is equal 100% if it was charged completely.

圓桶形儲冰槽規格表
Specifications of circular ice storage tank

形式 (model)		單位	Dyn-260	Dyn-225	Dyn-200	Dyn-175	Dyn-160
能力 (capacity)	儲冰能力 (ice storage capacity)	Ton-Hr	260	225	200	175	160
		kW-h	914	791	703	615	562
	顯熱(sensible heat)	kW-h	137	119	105	92	84
	潛熱(latent heat)	kW-h	777	672	598	523	478
外型尺寸 (dimension)	直徑(diameter)	mm	2450	2450	2320	2180	2450
	高度(height)	mm	2950	2550	2550	2550	1950
材質 (material)	內槽體(inner shell) 外槽體(outer shell)	N/A	SUS 304 不銹鋼板 (SUS 304 Stainless steel plate)				
	上蓋(top cover) 底座(bottom base)	N/A	玻璃纖維強化塑膠 FRP (Fiberglass reinforced plastics, FRP)				
	主分佈管 (main distributive pipe)	N/A	SUS 304 不銹鋼管 (SUS 304 Stainless steel pipe)				
	隔板(partition)	N/A	耐低溫 PE 隔板 (freeze-resisting PE Plate)				
	結冰盤管(ice coil)	N/A	16mm 耐低溫 PE 管 (16 mm freeze-resisting PE pipe)				
保溫 (insulation)	上蓋板(top plate)	N/A	75mm PU 發泡保溫庫板 (75mm isolated plate of PU formed)				
	四周及底板 (side & bottom plate)	N/A	75mm PU 發泡保溫庫板 (75mm isolated plate of PU formed)				
鹵水(brine)	濃度(concentration)	N/A	25%	25%	25%	25%	25%
	容量(volume)	liter	550	500	450	400	350
熱交換管路 (HX tubing)	循環水量(water flow rate)	LPM	350	320	290	260	240
	壓降 (pressure drop)	M	9.2	9.0	8.2	7.8	7.0
接管 (connection)	鹵水出入口 (brine inlet/outlet)	inch	65A (2-1/2B)×10K 法蘭 (flange)		50A (2B) 牙口 (screw)		
重量 (weight)	淨重(shipping weight)	kg	980	860	780	700	620
	運轉重量 (operating weight)	kg	10080	8890	7920	6930	5940
操作壓力(operating pressure)			max. 8.8 kg/cm^2 (125 psi)				
測試壓力(tested pressure)			12.2 kg/cm^2 (175 psi)				
操作溫度範圍(operating temp. range)			-15 ℃ ~ 50 ℃ (-5°F ~120°F)				
儲冰容量顯示計(charge indicator)			0 ~ 100% 刻度 (scale)				
儲冰容量感測計(選配) (ice capacity sensor by optional)			4~20 mA output (option)				

備註(Remark)：

(1)以上儲冰槽為標準規格，歡迎訂製其他規格儲冰槽。

As table described above, tanks are standard specification. Welcome to order special specifications.

(2)儲冰容量計算依據 ARI Standard 900-1998。

Net usable ice storage capacity was calculated according to the ARI Standard 900-1998.

(3)以上規格若有變更恕不另行通知。

Specifications are subject to change without notice for further improvement.

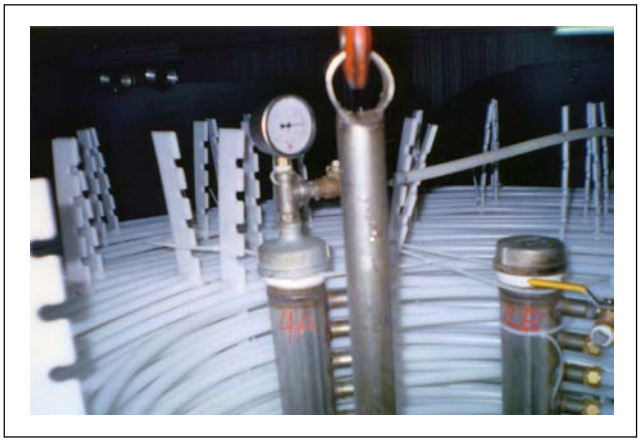
應用實例
Application examples

儲冰槽卡車運輸
Ice storage tanks transported by truck

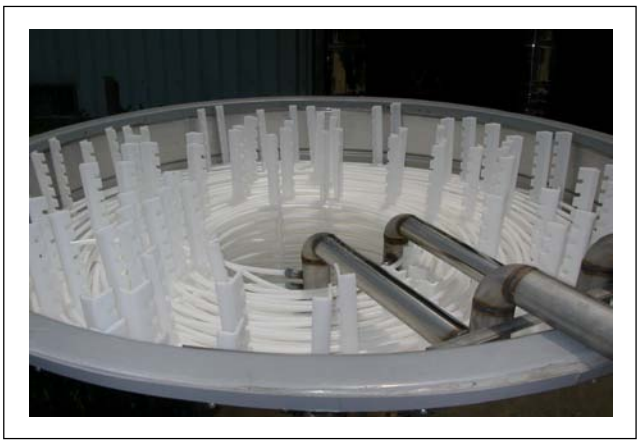
儲冰槽貨櫃運輸
Ice storage tanks transported by container truck

儲冰槽製作完成外型
The fabricated outline of ice storage tanks

儲冰槽現場配置與配管
Local layout and piping of ice storage tanks



儲冰槽盤管試壓(12 bar)
Pressure testing for the coil of ice storage tank (12 bar)



儲冰盤管與分佈管配置
The ice storage coil and the layout of distributive pipes

部份應用實績
Partial reference projects

台大醫院　兒童醫療大樓
National Taiwan University Hospital
Dyn-1080 × 9 台 (sets)

高雄第一科技大學活動中心
National Kaohsiung First University of Science and Technology
Dyn-900 × 6 台 (sets)

高橋自動化科技(中科)廠
Tera autoteck corporation Inc. (Central Taiwan Science Park)
Dyn-900 × 12 台 (sets)

台灣藝術大學
National Taiwan University of Arts
Dyn-1250 × 2 台 (sets)

崑山科技大學圖書資訊館
Kun-san University
Dyn-815 × 5 台 (sets)

台北市十二號公園商店街
Business Street of Taipei No. 12 Park
Dyn-2500 × 2 台 (sets)

交通部仁愛大廈
Ren-ai Building, Ministry of Transportation And Communications
Dyn-225 × 28 台 (sets)

中央研究院人文館
Building of Humanities and Social Sciences, Academia Sinica
Dyn-225 × 29 台 (sets)

廣東東莞洲磊電子
Dong-guan Unilight Electronics Co., Ltd.. , Main China
Dyn-200 × 14 台 (sets)

新竹市文化局演藝廳
Hsing-Chu Municipal Performance Hall
Dyn-1500 × 2 台 (sets)

南部科學園區管理中心
Center of South Taiwan Science Park Administration
Dyn-815 × 4 台 (sets)

法務部司法大廈
Judicial building, Ministry Of Justice
Dyn-735 × 7 台 (sets)

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