Trane Thailand e-Magazine

APRIL 2019 : ISSUE 75

พัลลภ เตชะสุวรรณ์
Thailand Country General Manager

เดือนเมษายนในปีนี้ เป็นปีที่เราได้สัมผัสกับอุณหภูมิสูงกว่า 40 องศาเซลเซียสกันบ่อยครั้ง และแน่นอนว่าคนในแวดวงเครื่องปรับอากาศได้ทำงานหนักกันทุกฝ่าย ไม่ว่าจะเป็นฝ่ายขายหรือฝ่ายบริการ โดยเฉพาะการบริการหลังการขายที่เรามุ่งเน้นการบริการให้สมกับสโลแกน 'เทรน...เย็นใจ...ไม่ทอดทิ้ง' โดยลูกค้ามีช่องทางการติดต่อเราได้อย่างสะดวกสบายทุกช่องทาง ไม่ว่าจะเป็น Line@tranethailand, Facebook/tranethailand, แอปพลิเคชั่น 'Trane Thailand' และอีเมลใหม่ของเรา info.tranethailand@trane.com

สำหรับร้อนนี้ ขอให้ทุกท่านระมัดระวังโรคภัยที่เกิดจากอากาศร้อนทั้งในคนและสัตว์ เช่น โรคฮีทสโตรก, โรคท้องร่วง รวมถึงระมัดระวังการเกิดเหตุอัคคีภัยอันเกิดจากสภาพอากาศที่ร้อนระอุ โดยให้ท่านตรวจตราอุปกรณ์ไฟฟ้าในบ้าน เตาแก๊ส ดับธูปเทียนไหว้พระ รวมถึงก้นบุหรี่....เปิดแอร์ 'เทรน' กันให้เย็นฉ่ำ และนั่งอ่านสาระดีๆ จาก Trane Thailand e-Magazine ฉบับนี้กันครับ

Content

เปลี่ยน F° ให้เป็น C°

รีโมทแอร์ 'เทรน' รุ่นต่างๆ

สำหรับลูกค้า หรือช่างบริการที่มีโอกาสใช้งานเครื่องปรับอากาศ ‘เทรน’ รุ่นต่างๆ อาจพบปัญหารีโมท มีการเปลี่ยนหน่วยอุณหภูมิจากองศาเซลเซียส (C°) เป็นองศาฟาเรนไฮต์ (F°) ซึ่งวิธีการเปลี่ยนหน่วยอุณหภูมิของรีโมท ‘เทรน’ รุ่นหลักๆ มีวิธีดังนี้

A

กด SEND ค้างไว้ 5 วินาที

B

กด MODE และ - พร้อมกัน

C

กด ∧ และ V พร้อมกัน ค้างไว้ 5 วินาที

D

กด SLEEP และ SWEEP พร้อมกัน

E

กด ∧ และ V พร้อมกัน ค้างไว้ 3 วินาที

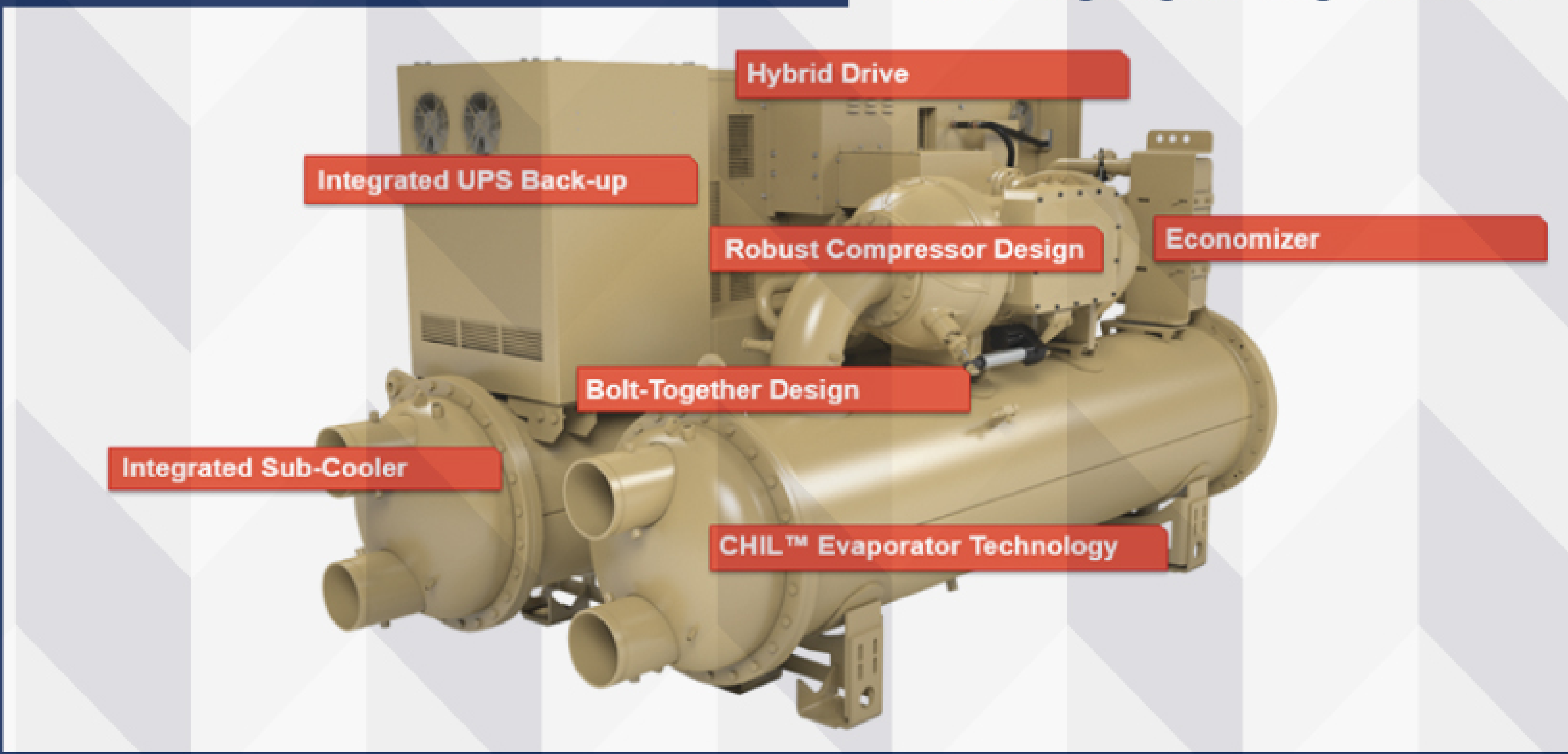
Trane Agility™ Centrifugal Chiller

NEW

Compact design for lower installed costs
Efficient choice delivers operational savings
Reliability that means greater uptime and lower maintenance costs
Environmental benefits to meet sustainability goals

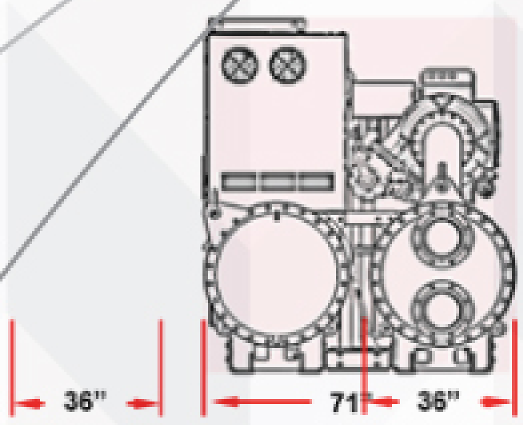
จากการพัฒนาและรักษาประสิทธิภาพอย่างต่อเนื่อง เทรน ได้มีการพัฒนาผลิตภัณฑ์เครื่องทำความเย็นแบบแรงเหวี่ยง (centrifugal chillers) รุ่นใหม่ Trane Agility ™ Centrifugal Chiller ที่มีขนาดกะทัดรัด ลดความซับซ้อนในการติดตั้ง ทำให้ติดตั้งง่าย และลดต้นทุนในการติดตั้ง อีกทั้งมีการออกแบบให้การทำงานของเครื่องชิลเลอร์เงียบขึ้น โดยคำนึงถึงสภาพแวดล้อมที่ไวต่อเสียง เช่น โรงเรียน โรงแรม อาคารสำนักงาน พิพิธภัณฑ์ และคอนโดมิเนียม

Trane AgilityTM Key Features



TRANE

1 Compact Design



Bolt-Together Design

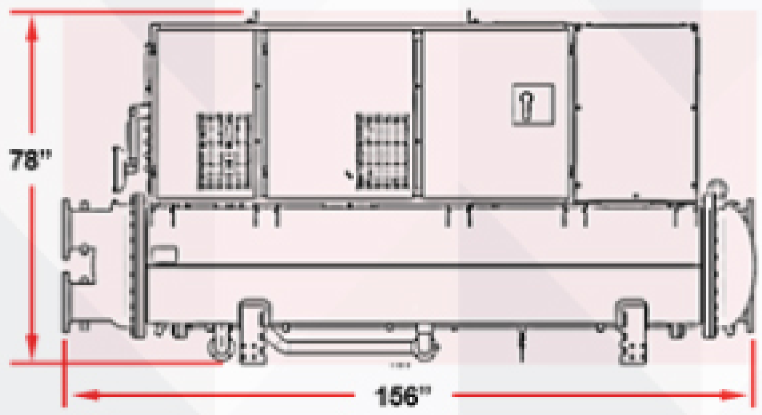
Easy Disassembly

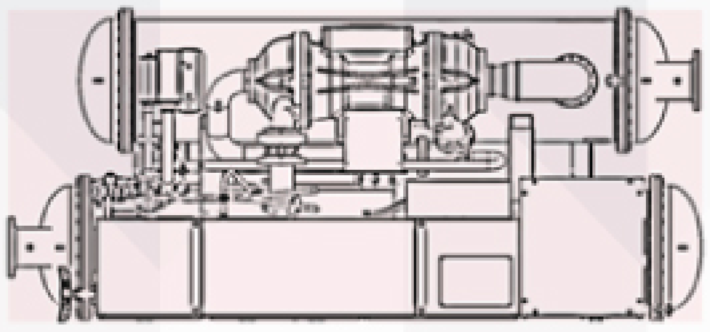
- Field separable – 2 section 36" wide
- Fast a simple installations

Overall Dimensions

- Length 156" (130" w/o water boxes)
- Width 71"
- Height 78"

Lower Installed Costs

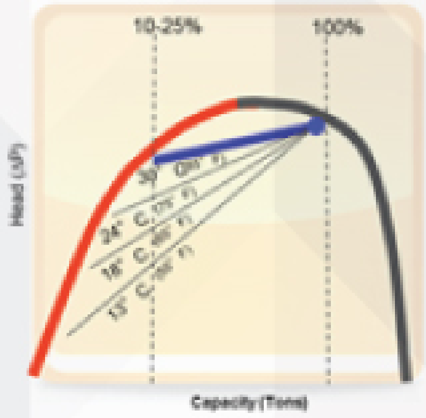




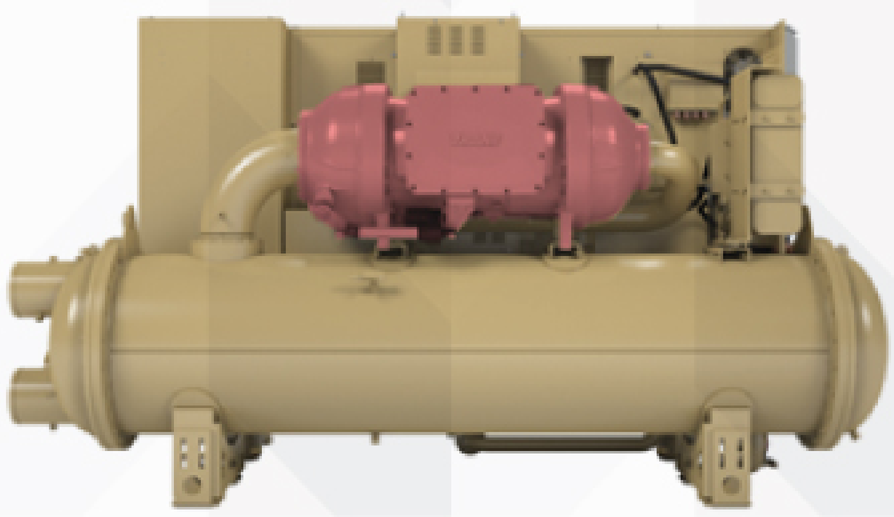
2 AgilityTM Compressor

Robust Compressor Design

- Multi-stage, Direct drive
- Magnetic Bearings
- Speed optimized for refrigerant
- Balance thrust design
- Wide-operating map, high-lift
- Permanent magnet motor
- Oil-free design

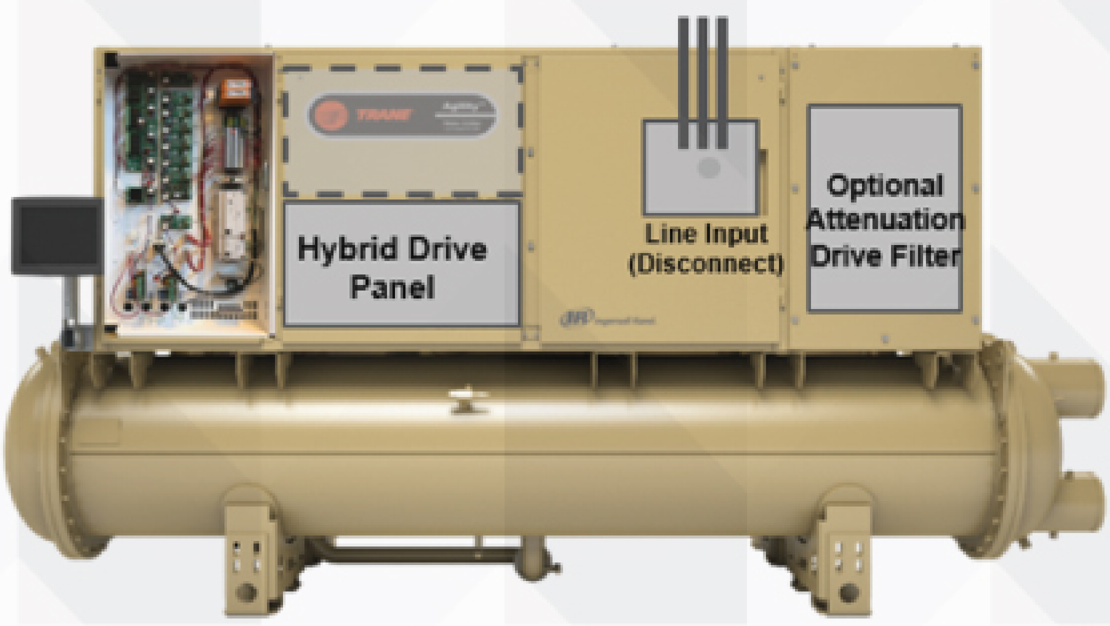


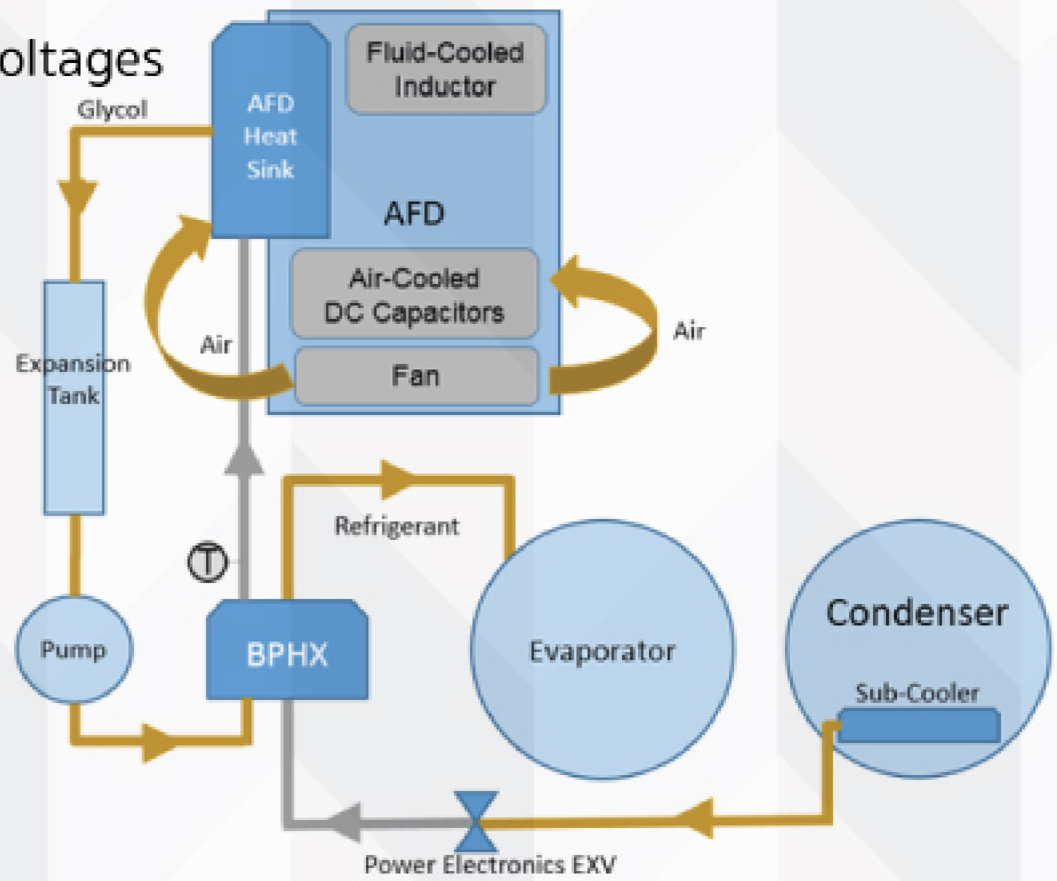
Multi-Stage provides stable operation over a wider operating map delivering efficiency AND reliability



3 Hybrid Drive

- Best of air-cooled and liquid cooled technology
- Fits within chiller footprint
- Easy access for serviceability
- Optional Harmonic Attenuation
- Optional transformer to provide for 208 and 575 voltages
- Integrated UPS Back-Up - design for 25 year life

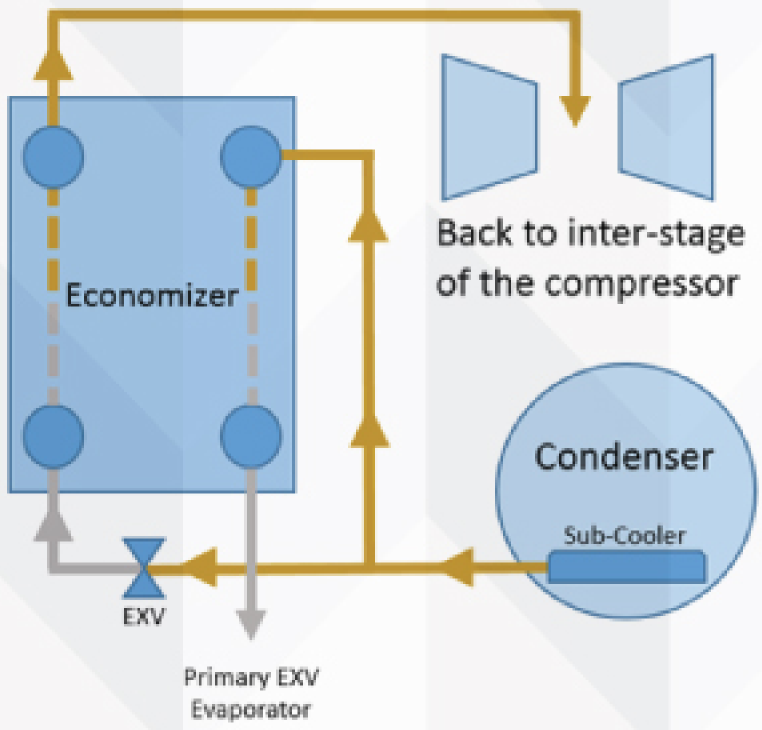




4 Integrated UPS Back-up

- Backs up the control board for the magnetic bearings
- Completely isolates the cabinet from utility power enabling error-free operation during power sags, spikes, and other anomalies

5 Economizer & Sub-Cooler

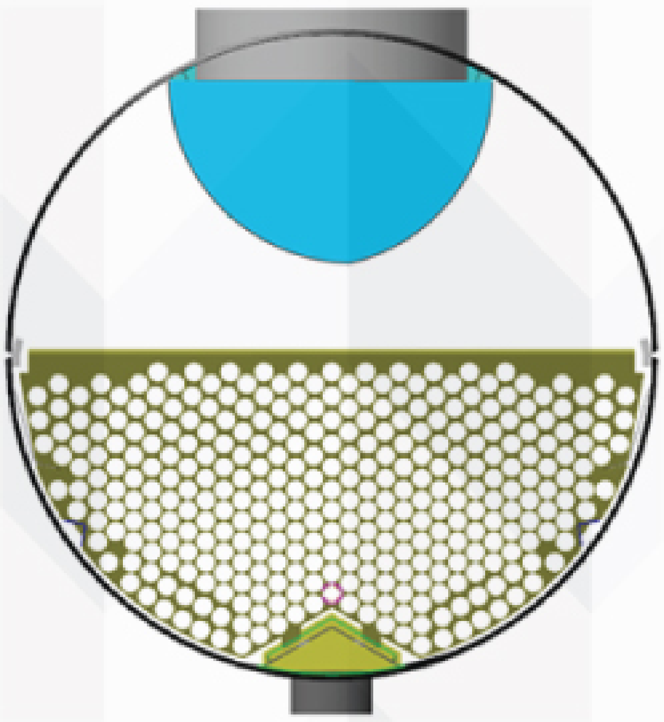


Economizer
- Refrigerant to refrigerant Brazed Plate Design
- Small portion of condensed liquid is flashed to inter-stage pressure
- Primary liquid flow is delivered to heat exchanger

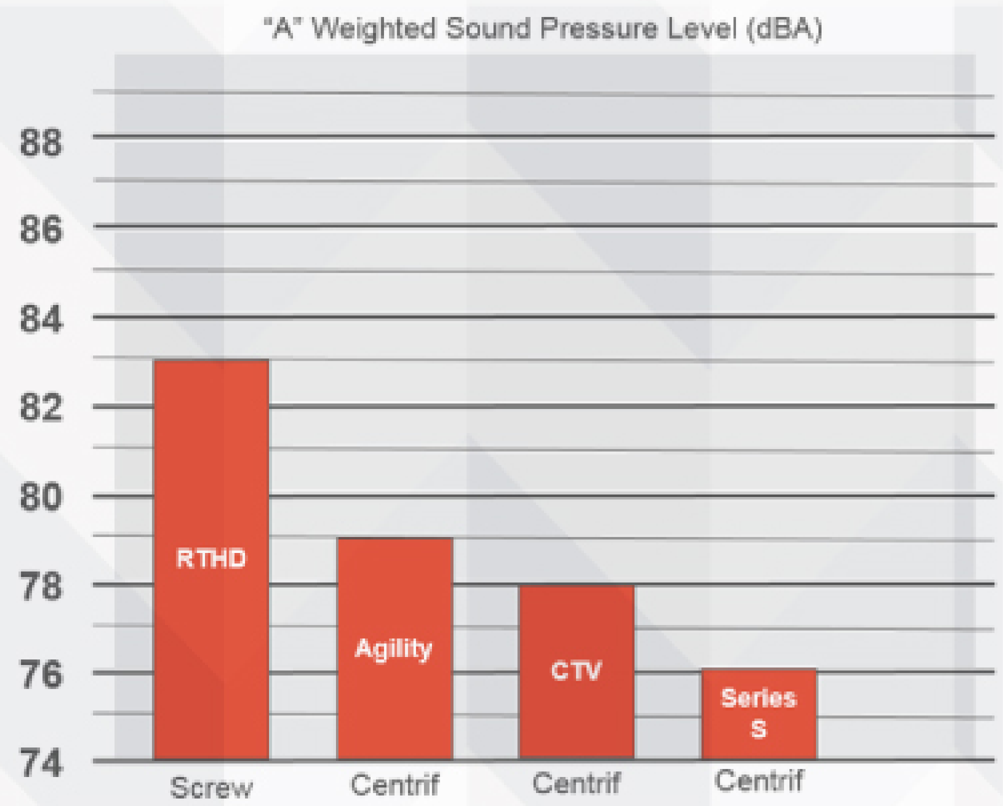
Integrated Sub-Cooler
- Lowers the enthalpy and pressure prior to economizer
  - Improved chiller performance
  - Higher chiller capacity
  - Smaller heat exchangers
- Intermediate sub-cooling baffles induce mixing and guide/support tubes

6 Evaporator Technology

- Suction Duct & Distributor design allows for higher vapor velocity
  - Reduces total refrigerant charge by up to 25%
  - Reduces evaporator footprint by up to 25%
  - Improves efficiency over traditional falling film or flooded designs
  - Reduces risk for carryover for increased reliability
- 2-Pass reversible water boxes



7 Acoustic Performance



Acoustic Considerations
- Designed with sound in mind
  - Optimized Speed
  - Direct Drive
- Ideal for sound sensitive environments
  - Schools
  - Hotels
  - Office buildings
  - Museums
  - Condominiums

Pressure Vessel วัสดุที่ใช้ทำภาชนะรับแรงดัน

สำหรับถังเก็บน้ำร้อนในอาคารประเภทโรงแรมถือว่าเป็นภาชนะรับแรงดัน ดังนั้นในการออกแบบควรจะอ้างอิง ASME Section VIII ซึ่งได้นิยามว่าภาชนะที่พิจารณาว่าเป็นภาชนะรับแรงดัน คือ ใช้งานที่ความดันสูงกว่าบรรยากาศเกินกว่า 15 psi (1.042 bar) ไม่ได้กำหนดอุณหภูมิแบบช่วงไว้วัสดุที่นำมาใช้ทำจะมีระบุเป็นหมายเลขตามชิ้นส่วนที่นำมาประกอบ

MATERIAL SPECIFICATION	
SHELL, HEAD, PADS	SA516 Gr.60
SADDLE	SA285 Gr. C
FORGED NOZZLES, FLANGES AND COVERS	SA105
NOZZLE NECK PLATE	SA516 Gr.60
NOZZLE NECK PIPE	SA106 Gr. B
INTERNAL SUPPORTS WELDED TO SHELL	SA516 Gr.60
EXTERNAL SUPPORTS WELDED TO SHELL	SA516 Gr.60
PLATE FLANGES AND COVERS	-
GRATING, BAFFLE	SA516 Gr.60
SCREENS, WIRE MESH DEMISTERS	-
INTERNAL PIPE	SA106 Gr. B
INTERNAL BOLTS/NUTS	A193 Gr.B8 CL2/A194 Gr.8
EXTERNAL BOLTS/NUTS	A193 Gr.B7 CL2/A194 Gr.2H
INTERNAL GASKETS	-
EXTERNAL GASKETS	
INSULATION	MINERAL WOOL
FOUNNDATION BOLTS 7 NUTS	SA307 Gr. C/SA563 Gr A (GAL V.)
EARTH LUGS	304 S.S
NAME PLATE	304 S.S

ตารางที่ 1 แสดงมาตรฐานชิ้นส่วนต่างที่นำมาเป็นภาชนะรับแรงดัน

สำหรับแผ่นเหล็กที่นำมาม้วนทำผนัง (shell) และแผ่นปิดหัวท้าย (Head) สามารถระบุตามมาตรฐานวัสดุดังต่อไปนี้

- SA-212 : Specification for High Tensile Strength Carbon-Silicon Steel Plates for Boilers and Other Pressure Vessels.
- SA-285 : Specification for Pressure Vessel Plates, Carbon Steel, Low and Intermediate-Tensile Strength.
- SA-299 : Specification for Pressure Vessel Plates, Carbon Steel, Manganese- Silicon.
- SA-433 : Specification for Leaded Carbon Steel Plates for Pressure Vessels.
- SA-442 : Specification for Pressure Vessel Plates, Carbon Steel, Improved Transition Properties.
- SA-455 : Specification for Pressure Vessel Plates, Carbon Steel, High-Strength Manganese.
- SA-515 : Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate and Higher-Temperature Service.
- SA-516 : Specification for Pressure Vessel Plates, Carbon Steel, for Moderate and Lower-Temperature Service.
- SA-537 : Specification for Pressure Vessel Plates, Heat-Treated, Carbon- Manganese-Silicon Steel
- CEN 10028-2 : Specification for Flat Products Made of Steels for Pressure Purposes. Non-Alloy and Alloy Steels with Specified Elevated Temperature Properties.
- CEN 10028-5 : Specification for Flat Products Made of Steels for Pressure Purposes. Wieldable Fine Grain Steels, Thermos mechanically rolled.
- JIS G3103 : Carbon Steel and Molybdenum Alloy Steel Plates for Boilers and Other Pressure Vessels.
- JIS G3115 : Steel Plates for Pressure Vessels for Intermediate Temperature Service

จะพบว่าทุกมาตรฐานที่นำมาใช้จะระบุว่าใช้กับงานรับแรงดันทั้งสิ้น แต่ถ้าจะอ้างอิงมาตรฐาน ASME SECTION VIII, ต้องเป็นวัสดุที่ขึ้นต้นด้วย SA เท่านั้น สำหรับแผ่นเหล็ก SS400 อยู่ในมาตรฐาน JIS G3101: Rolled Steels for General Structure ไม่สามารถนำมาผลิตภาชนะรับแรงดัน เนื่องจากไม่มีการจำกัดปริมาณเปอร์เซ็นต์ ของคาร์บอนทำให้ไม่มีคุณสมบัติที่เหมาะสมในการนำมาใช้งาน ดังนั้นผู้ออกแบบและผู้รับเหมาควรมีความเข้าใจในการเลือกใช้วัสดุให้เหมาะสมกับการใช้งานและมาตรฐานสากลที่กำหนดไว้

รูปที่ 1 ภาชนะรับแรงดันที่รอการติดตั้ง

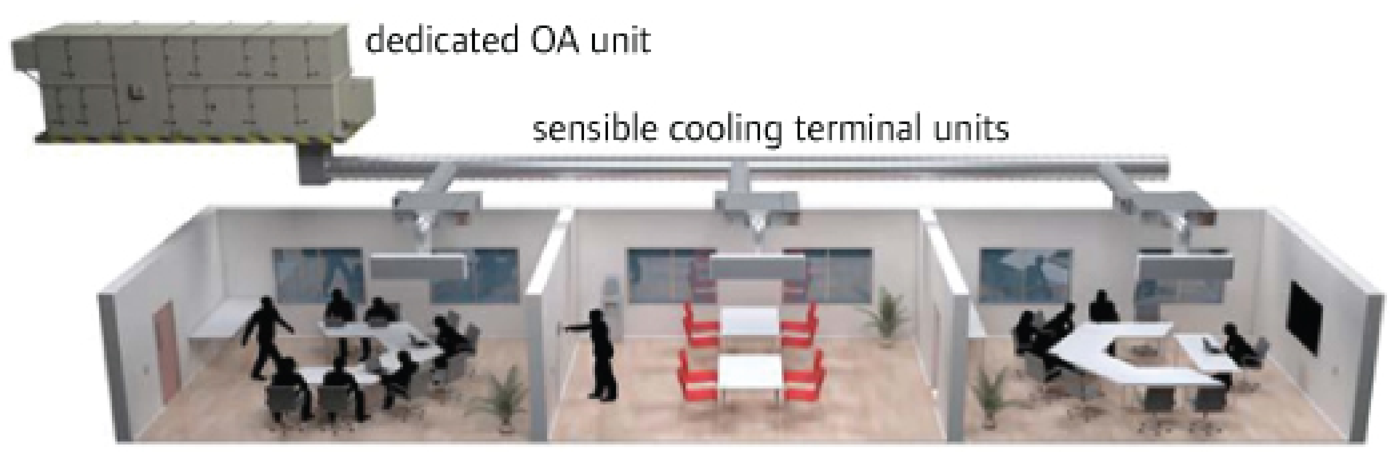
เอกสารอ้างอิง
Carbon Steel Handbook, Electric power research institute, 2006

Dedicated Outdoor Air System with Sensible-Cooling Terminal Units

As buildings continue to be designed for lower energy use, the resulting reduction in sensible cooling loads presents an economically feasible opportunity for systems that use zone-level, sensible-only cooling equipment. Examples include radiant cooling panels (or tubing embedded in the building structure), chilled beams, and terminal units with sensible-only cooling coils. The common function of these devices is that they are used to provide sensible cooling only, and are not able to provide any dehumidification (no condensation).

This Engineers Newsletter describes one such system that uses chilled-water, sensible-cooling terminal units.

Figure 1. DOAS with chilled-water, sensible-cooling terminal units



System Overview

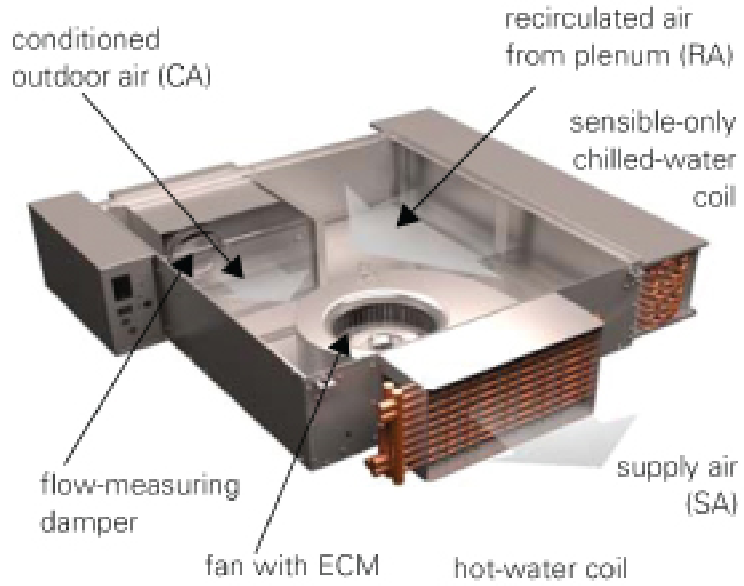
In this system, the outdoor air required for ventilation is conditioned by a dedicated outdoor-air unit. This unit filters, cools, dehumidifies, heats, and may even humidify this outdoor air before distributing it through a duct system to a terminal unit serving each zone (Figure 1).

Each terminal unit is equipped with a fan and a chilled-water coil mounted at the inlet from the ceiling plenum. The conditioned outdoor air (CA) from the dedicated OA unit enters each terminal unit through a flow-measuring damper (similar to, but smaller than used in a conventional VAV terminal), where it then mixes with recirculated air (RA) from the zone that has passed through the cooling coil. Finally, the terminal fan delivers this mixed supply air (SA) to the zone through downstream ductwork and diffusers (Figure 2). This fan is equipped with an electronically-commutated motor (ECM), which allows the fan speed, and therefore the supply airflow, to be varied as the zone load changes. For those zones that may require heating, a separate electric or hot-water coil may be added to the terminal unit.

The chilled water supplied to the terminal unit's cooling coil is controlled to a temperature above the zone dewpoint—typically between 56°F and 58°F—so that the cooling coil operates dry and providesonly sensible cooling (no dehumidification or condensation).

Therefore, the dedicated OA unit must dehumidify the outdoor air to a dew point that is dry enough to offset the entire zone latent load (due to people and infiltration, for example) and maintain the zone dew pointat or below a defined threshold—typically 55°F.

Figure 2. Example sensible-cooling terminal unit



TRANE

Control of Sensible-Cooling Terminal Units

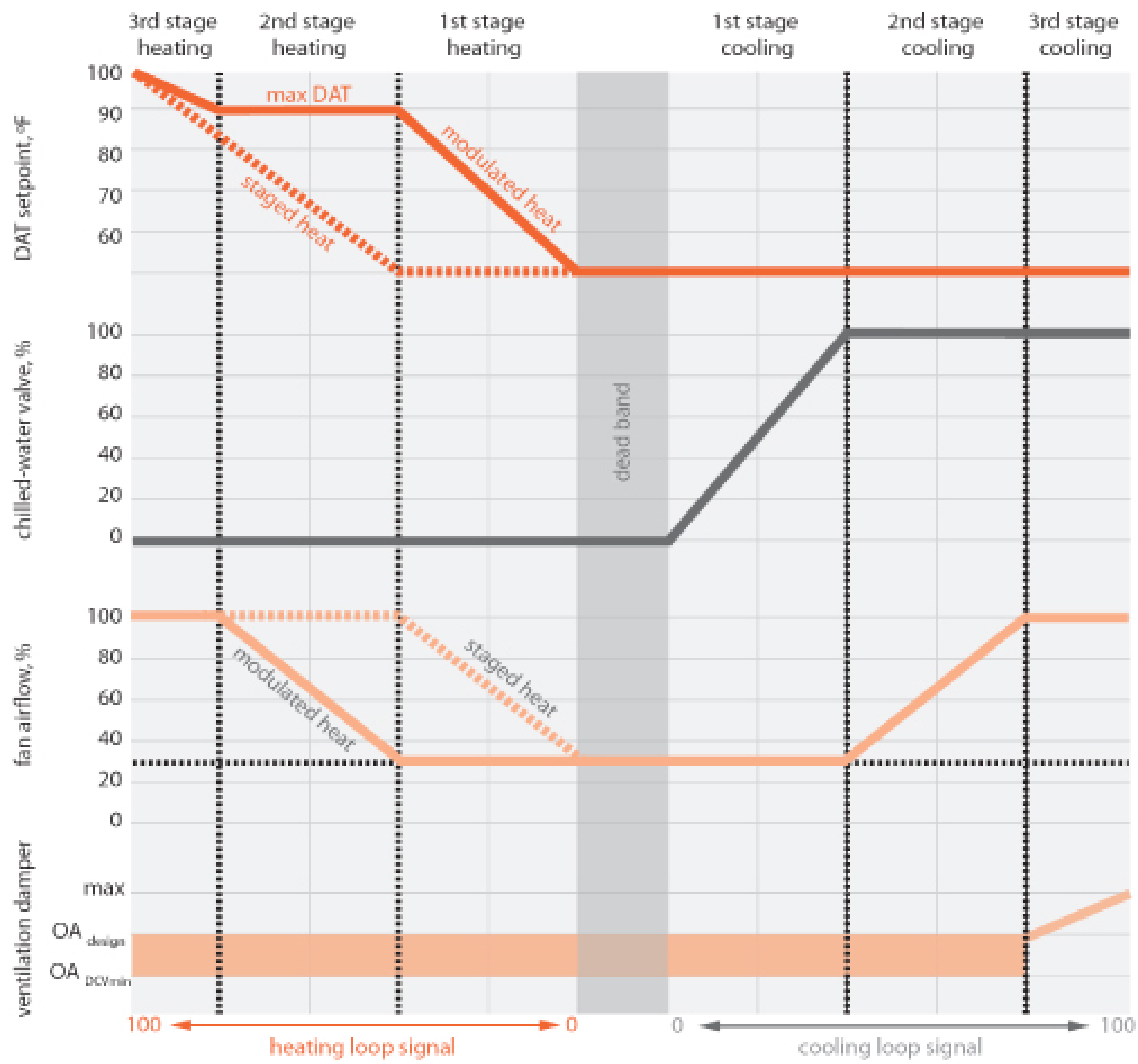
Each terminal unit provides independent control of the temperature in the zone it serves, while ensuring sufficient outdoor air for ventilation. Figure 3 depicts an example of the terminal unit control sequence during Occupied Mode.

Occupied Mode, Deadband. When the zone temperature is satisfied (in the deadband between its heating and cooling setpoints, depicted by the vertical grey bar in the center of the chart), the terminal fan operates at its minimum fan airflow setpoint, with both the chilled-water and hot-water valves closed (or electric heater off). The ventilation air damper is controlled to the minimum OA setpoint.

Occupied Mode, Cooling. When the zone temperature rises to its cooling setpoint, both the terminal fan speed and chilled-water valve are modulated to maintain zone temperature at setpoint, while the hot-water valve remains closed (or electric heater remains off). Moving from the deadband in Figure 3 to the right:

- 1st stage cooling: First, the chilled-water valve is modulated further open to maintain zone temperature at its cooling setpoint, while the fan remains operating at its minimum fan airflow setpoint and the ventilation air damper remains at its minimum OA setpoint.
- 2nd stage cooling: When the requested cooling capacity has increased to the point where the chilled-water valve is 100% open, the fan speed is increased to maintain zone temperature at its cooling setpoint, while the chilled-water valve remains fully open and the ventilation air damper remains at its minimum OA setpoint.
- 3rd stage cooling ("boost" mode): If the fan reaches its maximum fan airflow setpoint, but even more cooling capacity is required, the ventilation air damper can be modulated further open (increasing the flow rate of cool, dehumidified air) to maintain zone temperature at its cooling setpoint, while the chilled-water valve remains fully open and the fan continues operating at its maximum airflow setpoint.

Figure 3. Example of sensible-cooling terminal unit control



Occupied Mode, Heating. When the zone temperature drops to its heating setpoint, both the terminal fan speed and hot-water valve (or electric heater) are modulated to maintain zone temperature at setpoint, while the chilled-water valve remains closed and the ventilation air damper is controlled to the minimum OA setpoint. Moving from the deadband in Figure 3 to the left:

- 1st stage heating: First, the hot-water valve (or SCR electric heater) is modulated to maintain zone temperature at its heating setpoint, while the fan remains operating at its minimum fan airflow setpoint.
- 2nd stage heating: When the discharge air temperature (DAT) has reached the desired maximum limit (90°F, in this example), the fan speed is increased to maintain zone temperature at its heating setpoint, while the hot-water valve (or SCR electric heater) modulates to maintain DAT at this maximum limit.
- 3rd stage heating: If the fan reaches its maximum fan airflow setpoint, and more heat is still required, the hot-water valve (or SCR electric heater) can modulate further open to maintain zone temperature at its heating setpoint.

For terminal units equipped with staged electric heat, the heating sequence is reversed (depicted by dashed lines in Figure 3). First, fan speed is increased while the electric heater remains off. Then, when the fan has reached its maximum fan airflow setpoint, the electric heater is staged on to maintain zone temperature at its heating setpoint.

Demand-Controlled Ventilation. Since the dedicated OA unit delivers 100 percent outdoor air to a flow-measuring damper in each terminal unit, implementing demand-controlled ventilation (DCV) is quite straightforward. By installing a CO_2 sensor (or an occupancy sensor), outdoor airflow delivered to the terminal unit is adjusted by modulating the ventilation air damper (Figure 3)—between the outdoor airflow required at design population (OAdesign) and the minimum allowable outdoor airflow with DCV (OADCVmin)—based on the current CO_2 concentration in the zone.

TRANE®

This DCV sequence can be overridden, however, if additional cooling capacity is needed (see previous discussion of 3rd stage cooling), or if additional dehumidification is needed. If a zone humidity sensor is installed and the measured zone dew point rises above the desired threshold—55°F, for example—the ventilation air damper can be modulated further open (overriding DCV and increasing the flow rate of dehumidified air) until the zone dew point drops back below this threshold.

Condensate Avoidance. While the cooling coil in the terminal unit is intended to operate dry (no condensation), a drip pan is installed underneath this coil in the event that unintended condensation does occur.

If the moisture sensor installed in this drip pan detects the presence of condensate, the chilled-water valve is closed while the terminal fan and ventilation air damper continue to operate as normal, through the 2nd and 3rd stages of cooling. The chilled-water valve is allowed to open again when condensate is no longer detected.

In addition, if a zone humidity sensor is installed and the measured zone dew point rises above the entering chilled-water temperature, the chilled-water valve is closed while the terminal fan and ventilation air damper continue to operate as normal, through the 2nd and 3rd stages of cooling. The chilled-water valve is allowed to open again when the zone dew point drops back below the entering chilled-water temperature.

Filtration. ASHRAE® Standard 62.1-2016 requires a filter, with a MERV rating of at least 8, be installed upstream of all wetted surfaces:

5.8 Particulate Matter Removal.
Particulate matter filters or air cleaners having a minimum efficiency reporting value (MERV) of not less than 8 when rated in accordance with ASHRAE Standard 52.2 shall be provided upstream of all cooling coils or other devices with wetted surfaces through which air is supplied to an occupiable space. Exception: Cooling coils that are designed, controlled, and operated to provide sensible cooling only.

For this system, however, the terminal unit cooling coils are designed and operated to provide sensible cooling only. Therefore, as stated in the exception above, Standard 62.1 does not require a filter upstream of the terminal unit cooling coils.

While not required by Standard 62.1, it has the option to be equipped with a filter to clean the locally-recirculated air before it passes through the cooling coil. This provides an air cleaning benefit and keeps the coil cleaner, but it would require periodic replacement.

Dedicated OA Unit Configurations

As mentioned previously, all the outdoor air required for ventilation is conditioned by a dedicated OA unit and then distributed to a terminal unit serving each zone. To enable the chilled-water coils in the terminal units to operate dry (no condensation), the dedicated OA unit must dehumidify the outdoor air to a dew point that is dry enough to offset the entire space latent load and maintain the zone dew point at or below 55°F.

Determining Leaving-Air Dew Point (example: office space)

To compare various dedicated OA unit configurations, consider an example office building located in Jacksonville, Florida. The desired space conditions are 75°F dry bulb with 50 percent relative humidity, which equates to a 55°F indoor dew point and a humidity ratio of 64.7 gr/lb (W_{space}).

Using the default occupant density for an office (5 people/1000 ft^2) from ASHRAE Standard 62.1-2016, the minimum required outdoor airflow (V_{bz}) for an office space is 17 cfm/person [(5 cfm/person) + (0.06 cfm/ft^2) / (5 people/1000 ft^2)]. Assuming the only latent load in the space is due to people, then the space latent load ($Q_{space,latent}$) is 200 Btuh/person (2017 *ASHRAE Handbook of Fundamentals*, page 18.4, Table 1).

Therefore, to offset this space latent load ($Q_{space,latent}$) with the minimum required outdoor airflow (V_{bz}), and maintain the space humidity ratio (W_{space}) at 64.7 gr/lb, the dedicated OA unit must dehumidify the outdoor air to 47.6 gr/lb (W_{CA}), which equates to a 47°F dew point:

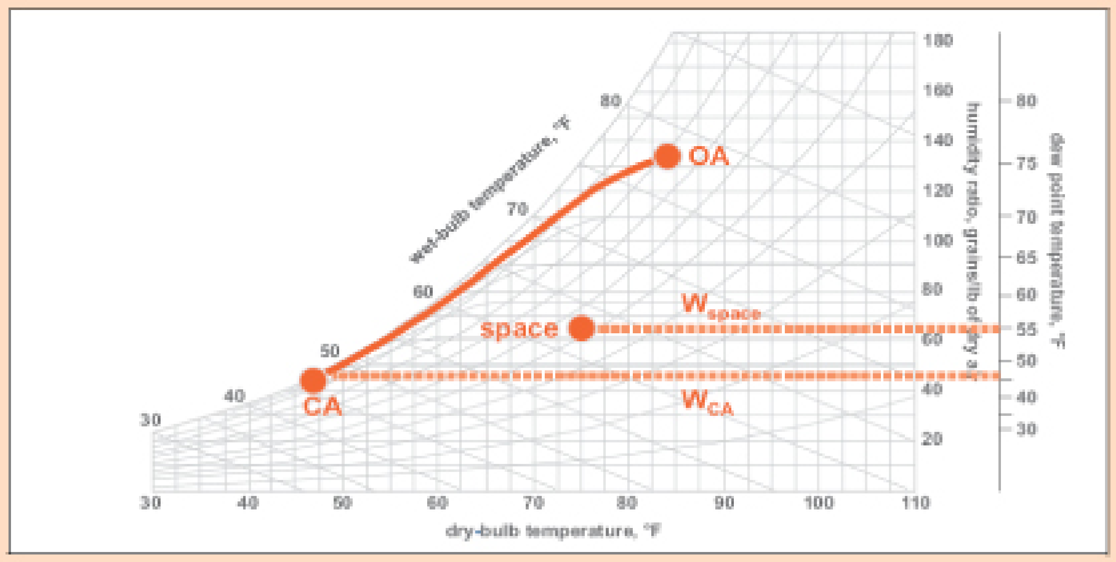
$$Q_{space,latent} = 0.69 \times V_{bz} \times (W_{space} - W_{CA})$$
$$200 \text{ Btuh/person} = 0.69 \times 17 \text{ cfm/person} \times (64.7 \text{ gr/lb} - W_{CA})$$
$$W_{CA} = 47.6 \text{ gr/lb (approximately 47°F dew point)}$$

Note: The value 0.69 in the above equation is not a constant, but is derived from the properties of air at "standard" conditions. Air at other conditions and elevations will cause this factor to change.

Of course, an alternate approach could be to increase the airflow delivered by the dedicated OA unit, which would allow for a higher leaving-air dew point. But this would increase the size of the dedicated OA unit and the ductwork.

For further discussion, see the Trane "Dedicated Outdoor Air Systems" application guide (SYS-APG001-EN).[1]

Figure 4. Determining DOAS leaving-air dew point



TRANE

Figure 5. Dedicated OA unit #1 (cooling coil + reheat)

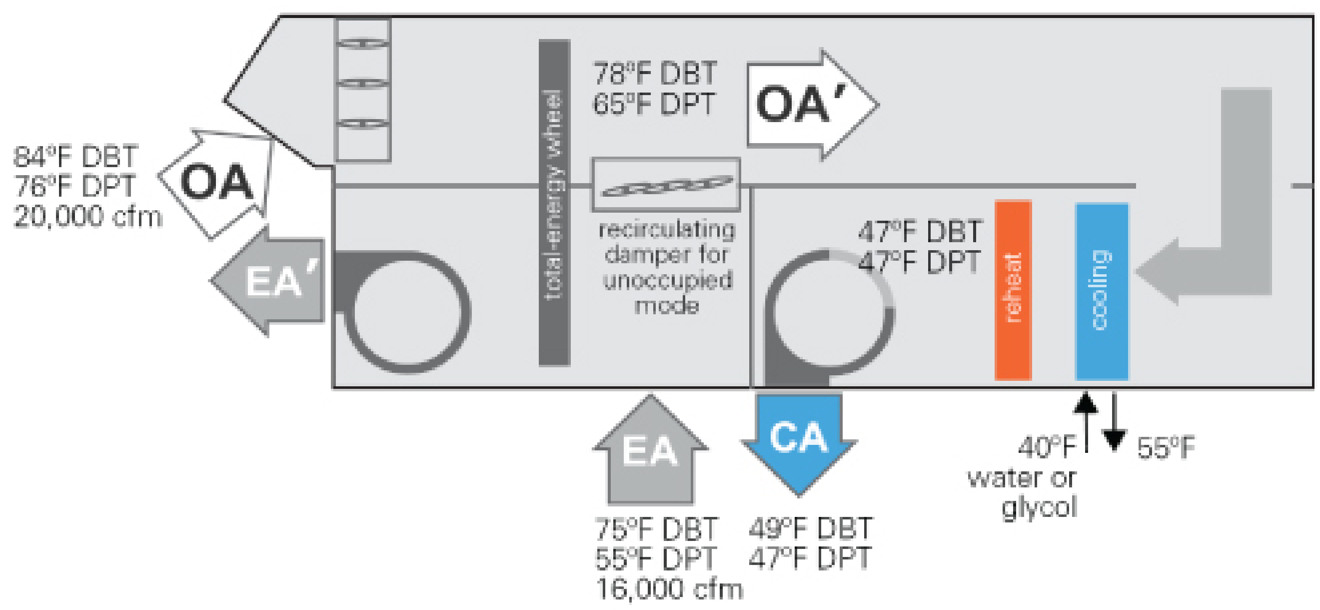


Figure 6. Dedicated OA unit #1 with two cooling coils in series

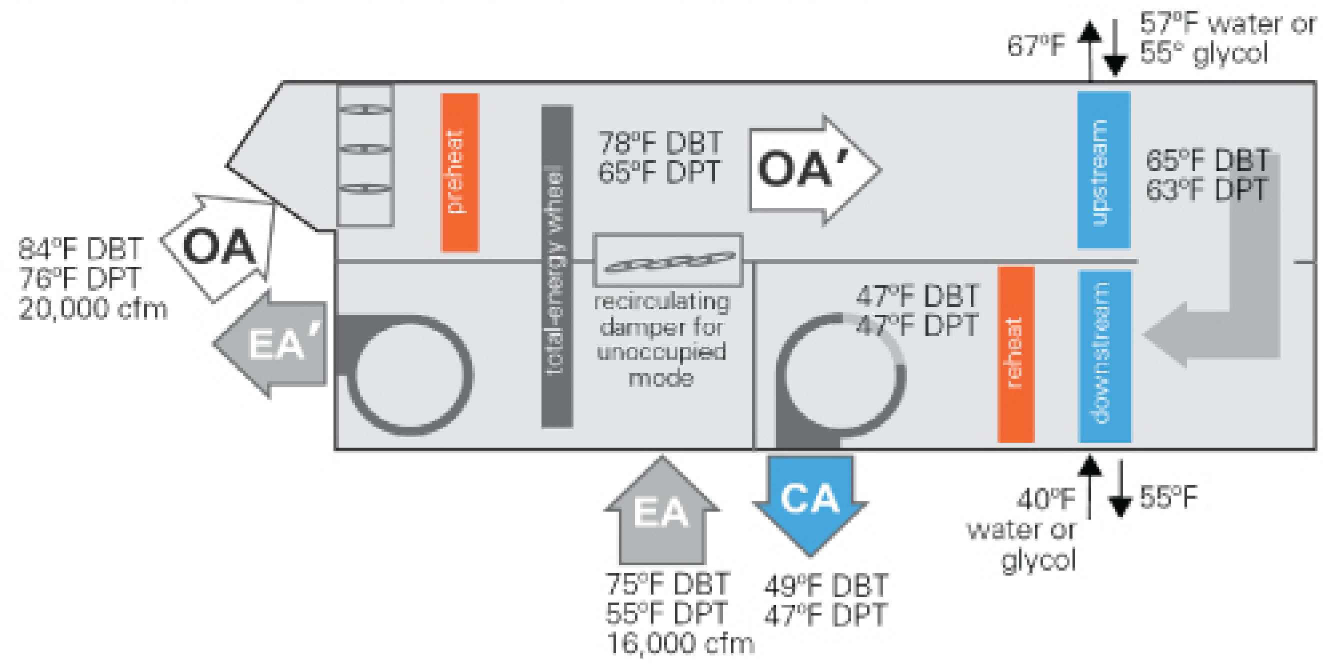
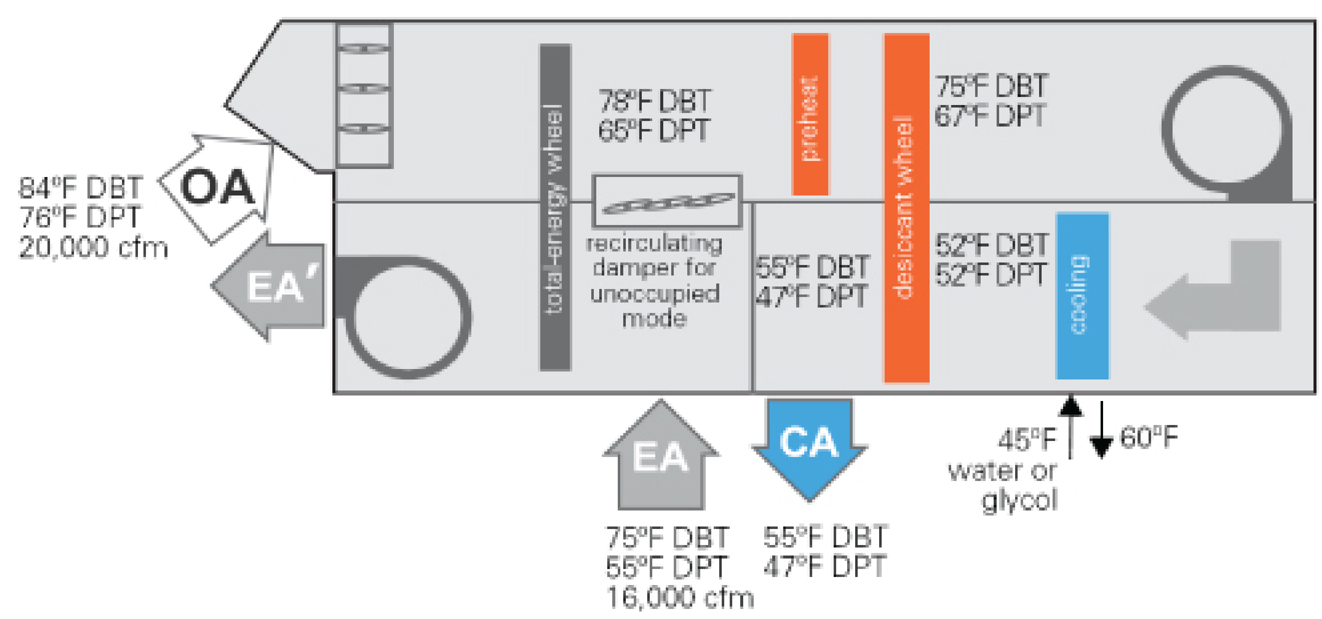


Figure 7. Dedicated OA unit #2 (cooling coil + series desiccant wheel)



In this section, we will examine a few dedicated OA unit configurations than might be used to dehumidify the outdoor air to the required 47°F dew point in our example (see inset below). For the purpose of this EN, we will assume that a chilled-water coil in the dedicated OA unit is supplied with 40°F water to dehumidify the outdoor air to a 47°F dew point, while the sensible-cooling terminal units are supplied with 57°F water to provide sensible cooling for the zones and avoid condensation (zone dew point of 55°F plus a margin of safety).

Cooling Coil + Reheat Coil. The first configuration includes a chilled-water cooling/ dehumidifying coil plus a reheat coil (Figure 5). Note that a total-energy wheel is included in all configurations, as well.

After the total-energy wheel preconditions the incoming outdoor air (transfers sensible heat and latent heat from the incoming outdoor air to the cooler, drier exhaust air), the cooling coil dehumidifies this air to the required 47°F dew point. In this example, with the exception of a few degrees of heat gain from the downstream fan, this dehumidified air is not reheated at design conditions.

Delivering this cold air (49°F) to the terminal units offsets part of the zone sensible cooling load. In this example, 20,000 cfm of this 49°F air offsets

47 tons of space sensible-cooling load, allowing the terminal fan airflows to be reduced and possibly allows for smaller cooling coils. This also allows for smaller pipes and pumps, and lower pumping energy, due to the need for less GPM to provide the remaining sensible cooling at the zone terminals.

This configuration provides the simplest and smallest footprint of the three configurations discussed in this EN. It also delivers the coldest air— 49°F, compared to 55°F or 64°F with the other two configurations—allowing for the zone-level terminals to be downsized the most (Table 1). However, delivering this cold of air requires careful attention to downstream duct insulation to prevent condensation.

A variation of this configuration is to use two separate chilled-water coils in series (Figure 6). The upstream coil is supplied with the same water produced for the sensible cooling coils in the terminal units, while the downstream coil is supplied with the colder 40°F water needed to dehumidify the outdoor air to the required 47°F dew point. The benefit of using series coils is that it shifts some of the DOAS load to the more-efficient, "warm-water" chiller. For this example, 30 tons of cooling load is provided by the "warm-water" chiller, reducing the load on the "cold-water" chiller from 107 tons to 77 tons.

Cooling Coil + Desiccant Dehumidification Wheel.

Because of the low leaving-air dew point required, this may be a good application for a series desiccant dehumidification wheel (Figure 7). In this configuration, after the incoming outdoor air is preconditioned by the total-energy wheel, it passes through the upstream side of the desiccant wheel, then through the cooling coil—which need to dehumidify this air to only a 52°F dew point—and finally through the downstream side of the desiccant wheel where the air is further dehumidified to the required 47°F leaving-air dew point.

One benefit of this configuration is that it does not require the dedicated OA unit to cool the air all the way down to approximately 47°F dry bulb in order to dehumidify it to the required 47°F dew point. Therefore, the chilled water supplied to the cooling coil may not need to be as cold—only 45°F in this example, compared to 40°F without the desiccant wheel.

Another benefit is that the leaving-air dry-bulb temperature is not as cold, which may help reduce the risk of condensation on uninsulated, downstream ductwork. In this example, the conditioned outdoor air (CA) leaves the unit at 55°F dry bulb, compared to 49°F in the first configuration without a series desiccant wheel. Note, however, that delivering this air to the zone-level terminals at a warmer temperature offsets less of the zone sensible cooling load—36 tons, compared to 47 tons without the desiccant wheel—which requires higher terminal fan airflows and possibly larger cooling coils. Of course, the desiccant wheel increases the physical size of the dedicated OA unit and it adds pressure loss in the airstream, which increases fan energy use.

This configuration could also use two chilled-water coils in series, which would shift some of the dedicated OA unit load to the more-efficient, "warm-water" chiller. In this example, this configuration allows for the smallest design load on the less-efficient, "cold-water" chiller with the other two configurations (Table 1).

Cooling Coil + Fixed-Plate Heat Exchanger. The final configuration includes a fixed-plate (sensible) heat exchanger located downstream of the cooling coil (Figure 8). After the total-energy wheel preconditions the incoming outdoor air, the cooling coil dehumidifies this air to the required 47°F dew point. This dehumidified air then passes through the heat exchanger where it is reheated (sensible heat is transferred from the warmer exhaust air) to 62°F dry bulb, in this example.

As the fixed-plate heat exchanger transfers heat to reheat the dehumidified air, it cools the exhaust airstream from 75°F to 57°F, in this example. This improves the performance of the total-energy wheel, allowing it to pre-cool the incoming outdoor air even further. This added benefit results in the smallest design cooling load on the dedicated OA unit— 85 tons compared 107 or 96 tons with the other two configurations (Table 1).

With this heat exchanger, the leaving-air dry-bulb temperature is warmer, 64°F in this example, which avoids any risk of condensation on downstream ductwork. But this warmer air does not allow the zone-level terminals to be downsized as much as the other two configurations (Table 1).

However, the fixed-plate heat exchanger does increase the physical size of the unit, and adds pressure loss that increases fan energy use.

Finally, as with the others, this configuration could use two chilled-water coils in series.

Figure 8. Dedicated OA unit #3 (cooling coil + fixed-plate heat exchanger)

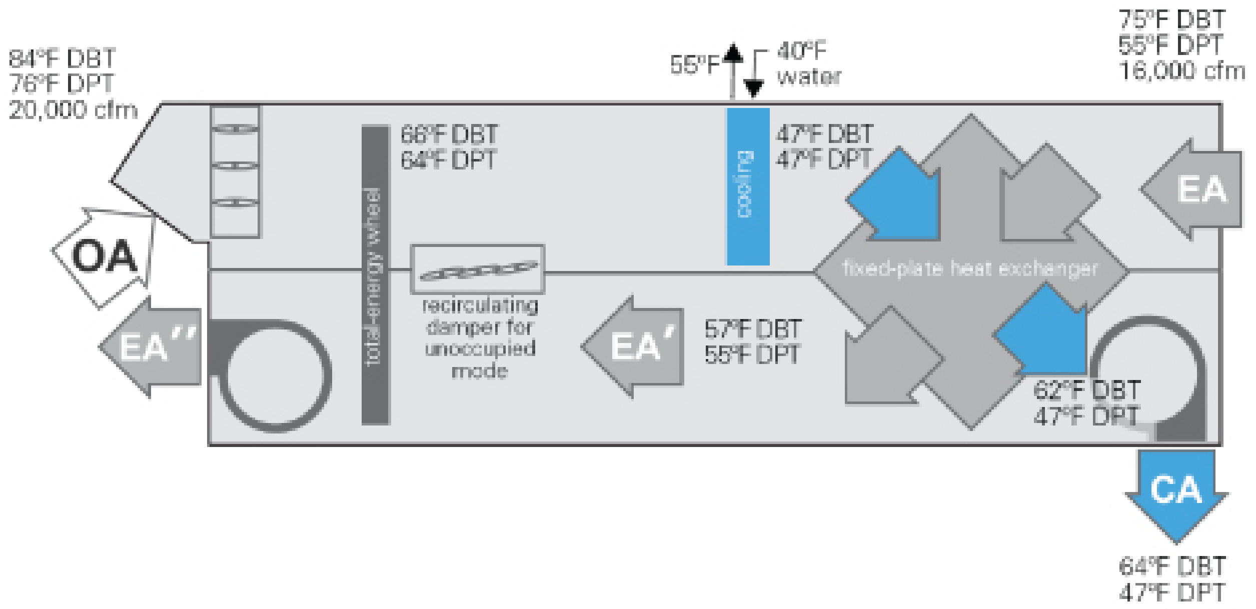


Table 1. Comparison on dedicated OA unit configurations

	unit #1 (cooling + reheat)		unit #2 (with desiccant wheel)		unit #3 (with fixed-plate HX)	
upstream cooling coil						
design load, tons		30		37		8
supply-water temperature		55°F		55°F		55°F
downstream cooling coil						
design load, tons	107	77	96	59	85	77
supply-water temperature	40°F	40°F	45°F	45°F	40°F	40°F
leaving-air conditions						
dry-bulb temperature	49°F	49°F	55°F	55°F	64°F	64°F
dew point temperature	47°F	47°F	47°F	47°F	47°F	47°F
sensible cooling by CA, tons	47	47	36	36	20	20
total DOAS design loads						
on "warm-water" chiller, tons		30		37		8
on "cold-water" chiller, tons	107	77	96	59	85	77

to be continued...

TRANE

We're Hiring
รับสมัครงาน

แผนก	ตำแหน่ง		อัตรา
Service Solutions	Assistant Service Manager	กรุงเทพฯ	1
	Sales Engineer (EBS)	กรุงเทพฯ	3
	Sales Engineer (EBS)	ขอนแก่น	1
	Technician	กรุงเทพฯ	2
	Technician	ภูเก็ต	1
	Technician	เชียงราย	1
Control & Contracting	Design Engineer	กรุงเทพฯ	1
Applied	Sales Engineer	กรุงเทพฯ	1
Unitary	**Sales Engineer / Sales Representative** ดูแลพื้นที่ภาคเหนือ ฉะเชิงเทรา, จันทบุรี และระยอง		1
	Sales Engineer / Sales Representative ดูแลพื้นที่ภาคใต้ สมุทรสงคราม และสมุทรสาคร		1

ติดต่อคุณพรรณี โทร. 02-761-1111 ต่อ 8903, 088-809-6790

บริษัท แอร์โค จำกัด
เลขที่ 1126/2 อาคารวานิช 2 ชั้น 30-31
ถนนเพชรบุรีตัดใหม่ แขวงมักกะสัน เขตราชเทวี กรุงเทพฯ 10400
โทร. 0 2761 1111, 0 2761 1119

@tranethailand FB/tranethailand www.tranethailand.com