FläktGroup
SEMCO

SPECIALIZED
HEALTHY
AIR SOLUTIONS

LOW DEW POINT

EFFICIENT & EFFECTIVE

ASCENDANT

CONVENTIONAL COOLING, ACTIVE DESICCANT DEHUMIDIFICATION SYSTEM

ASCENDANT™

AHR EXPO
INNOVATION AWARDS
2016
WINNER

INDOOR AIR QUALITY Category

- Up to 60% less mechanical cooling capacity required to achieve a low supply air dew point
- Offers substantial energy and first cost savings
- Improve hygiene by ensuring that final filters remain dry

EXCELLENCE IN SOLUTIONS

Ascendant is a conventional cooling – active desiccant dehumidification system, performance optimized to deliver and control low dew point air while minimizing regeneration energy input in compliance with ASHRAE/AIA guidelines.

Ascendant easily allows a design consultant compliance with ALL ASHRAE/AIA guideline conditions while using far less energy than conventional approaches that do not achieve required low space dew point requirements. Ascendant provides more than three times the dehumidification capacity/cfm compared to customized DX cooling systems, enabling supply of dew points as low as 20°.

TIGHT LOW HUMIDITY AND TEMPERATURE CONTROL

Low space dew point conditions are easily achieved and tightly controlled by the customized control algorithms, factory installed sensors, and an on-board DDC controller.

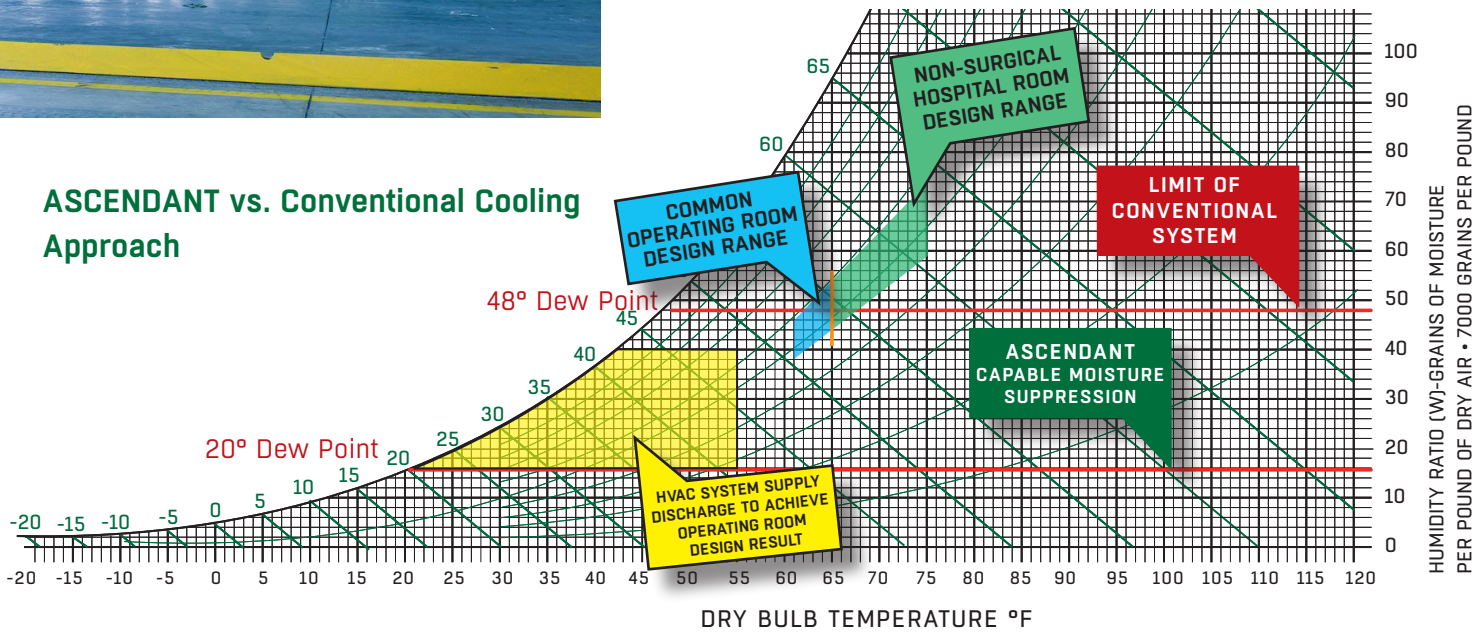
REDUCED COOLING TONS

Fewer tons of mechanical cooling capacity are required to achieve a low supply air dew point - up to 60% less cooling capacity required compared to custom DX systems. Many hours exist where dehumidification is accommodated with only the active desiccant wheel and no cooling is required.

ASCENDANT™

PROVIDES MORE THAN THREE TIMES THE DEHUMIDIFICATION CAPACITY/CFM THAN CUSTOMIZED DX COOLING SYSTEMS

ASCENDANT vs. Conventional Cooling Approach



SUBSTANTIAL ENERGY SAVINGS

Ascendant operates with 25% to 50% less energy cost than other conventional dehumidification systems as a result of improved cooling efficiency (higher suction temperatures) and by shifting much of the latent load from electrically driven vapor compression over to lower cost regeneration energy.

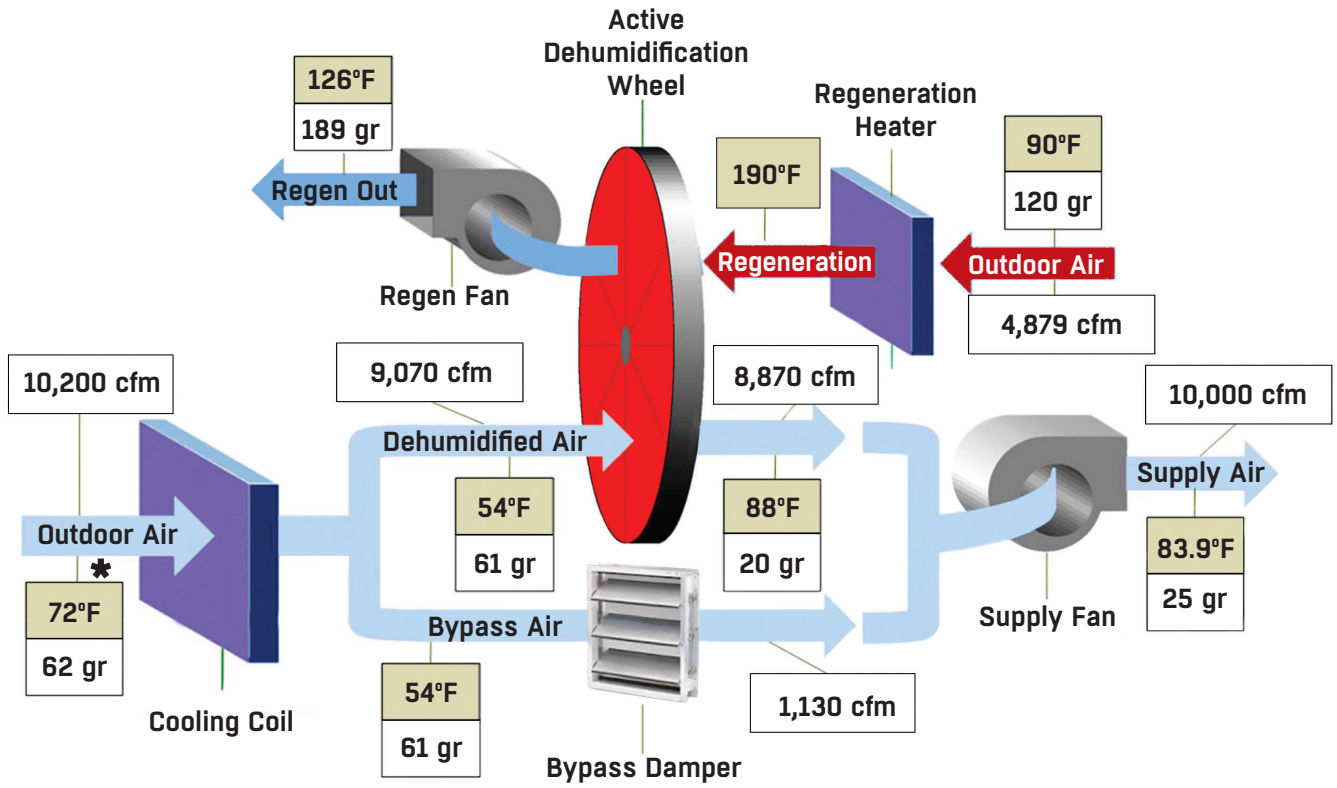
NO RETURN AIR PATH NEEDED

While total energy recovery is an important option when return air is available, it is not required to achieve efficient operation.

OPTIONAL TRUE 3Å WHEEL

SEMCO True 3Å wheel decreases outdoor air cooling tons by up to 60%. This energy recovery wheel limits contaminant carry-over to less than 0.045% and has the industry's best recovery efficiency ratio (RER).

FLOW SCHEMATIC



*** Based on optional Total Energy Recovery wheel to lower required cooling input**

Ascendant system processes outdoor and/or return air streams to a moderate leaving coil temperature condition (when needed), thereby delivering saturated air to the active desiccant wheel which promotes highly efficient moisture adsorption, further depressing the supply air humidity content to very low dew points

By employing moderate chilled water or refrigerant temperatures, the efficiency of the cooling system employed is high. (This is in sharp contrast to refrigeration based dehumidification systems which rely on low suction temperatures and very deep cooling coils to achieve lower dew points.)

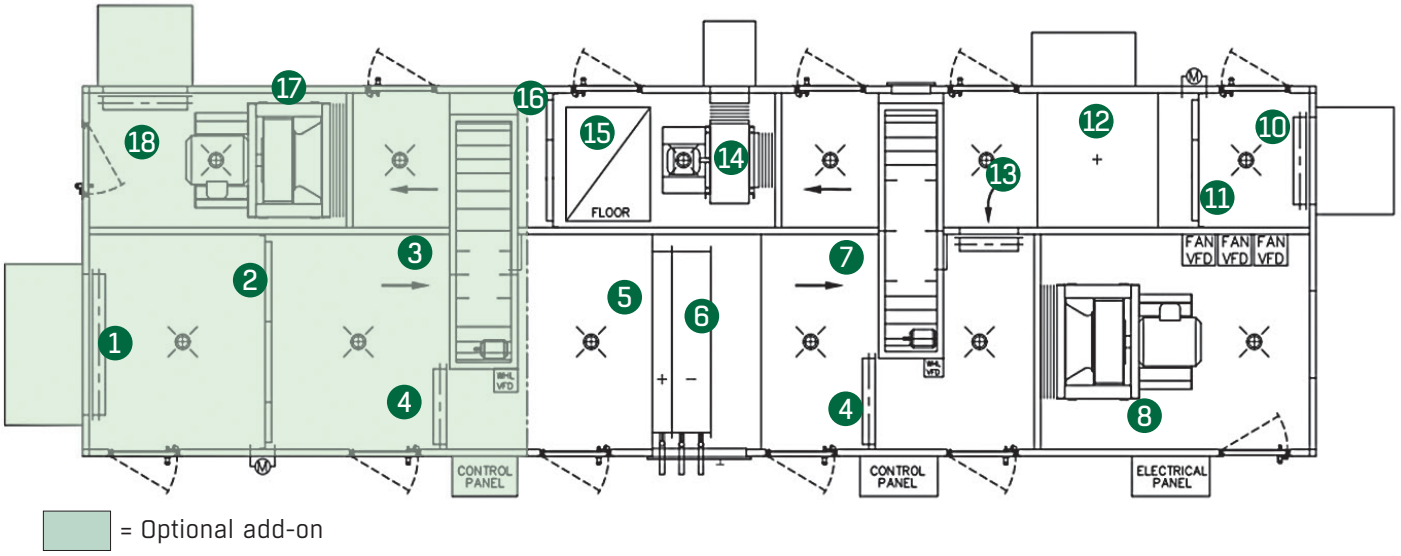
An integral modulating bypass damper allows the cool, moderately dry air leaving the cooling coil to be mixed with the appropriate quantity of warm, very dry air leaving the dehumidification wheel to deliver the required supply air dew point. If tight temperature control is also required, a small sensible only post cooling coil is employed.

Regeneration of the desiccant wheel is also achieved with high energy efficiency. A typical regeneration airflow quantity is only 20% - 40% of the supply airflow volume. Only moderate regeneration temperatures (140˚F to a maximum of 200˚F) are required, allowing the use of hot water, steam, direct fired gas or waste heat (i.e. by-product of a power generation (CHP)).

For applications where an exhaust airstream is available preconditioning the outdoor air with FläktGroup Semco total energy recovery is highly recommended since it substantially increases overall system energy efficiency and substantially reduces pre-cooling input requirements. It also provides valuable winter season preheat and humidification.

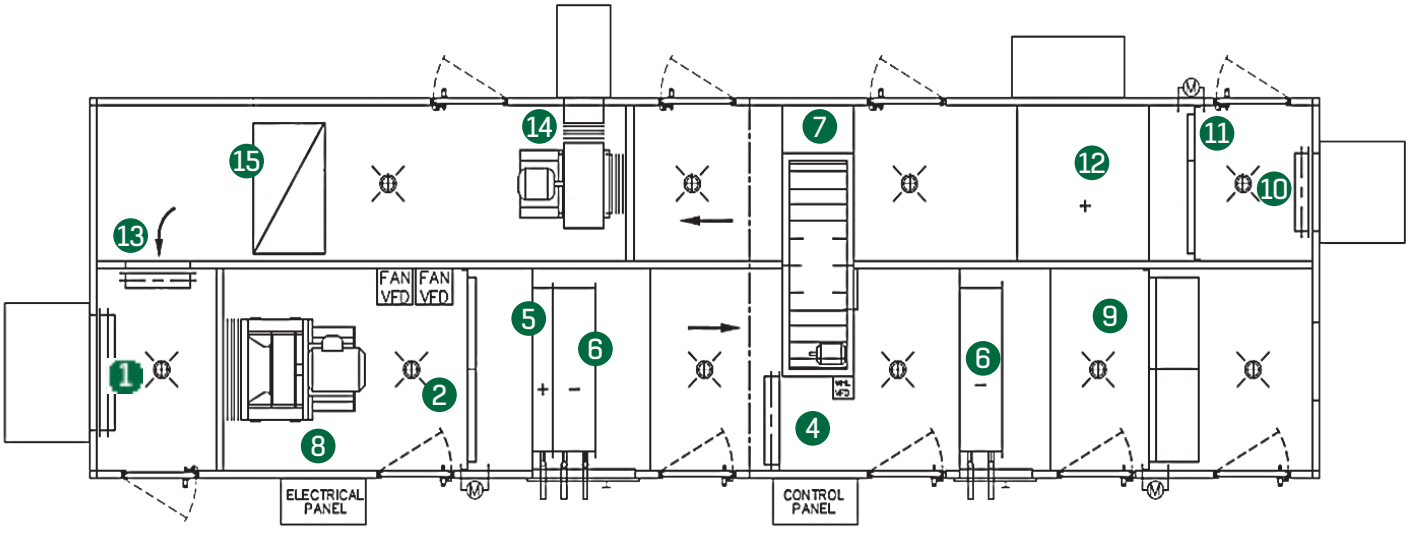
DEDICATED OUTSIDE AIR SYSTEM WITH OPTIONAL INTEGRATED TOTAL RECOVERY

- Pre-treats downstream air handling systems
- Optional benefit of total energy recovery for more energy efficient operation
- Provides preheat and humidification during the heating season



TOTAL CONDITIONING SYSTEM

Incorporates post cooling and final high efficiency filtration to allow for independent control of both temperature and humidity, providing total conditioning without supplemental air handlers to large spaces.



1	Outdoor Air Damper	7	Active Desiccant Wheel	13	Recirculation Damper
2	Outdoor Air Filter	8	Supply Air Fan	14	Regen Fan
3	Optional True 3Å Wheel	9	Final Filtration	15	Optional Return Air Opening
4	Wheel Bypass Damper	10	Regen Inlet Damper	16	Return Air Filtration
5	Heating Coil	11	Regen Air Filtration	17	Exhaust Air Fan
6	Pre & Post Cooling Coil	12	Regeneration Source	18	Exhaust Air Damper

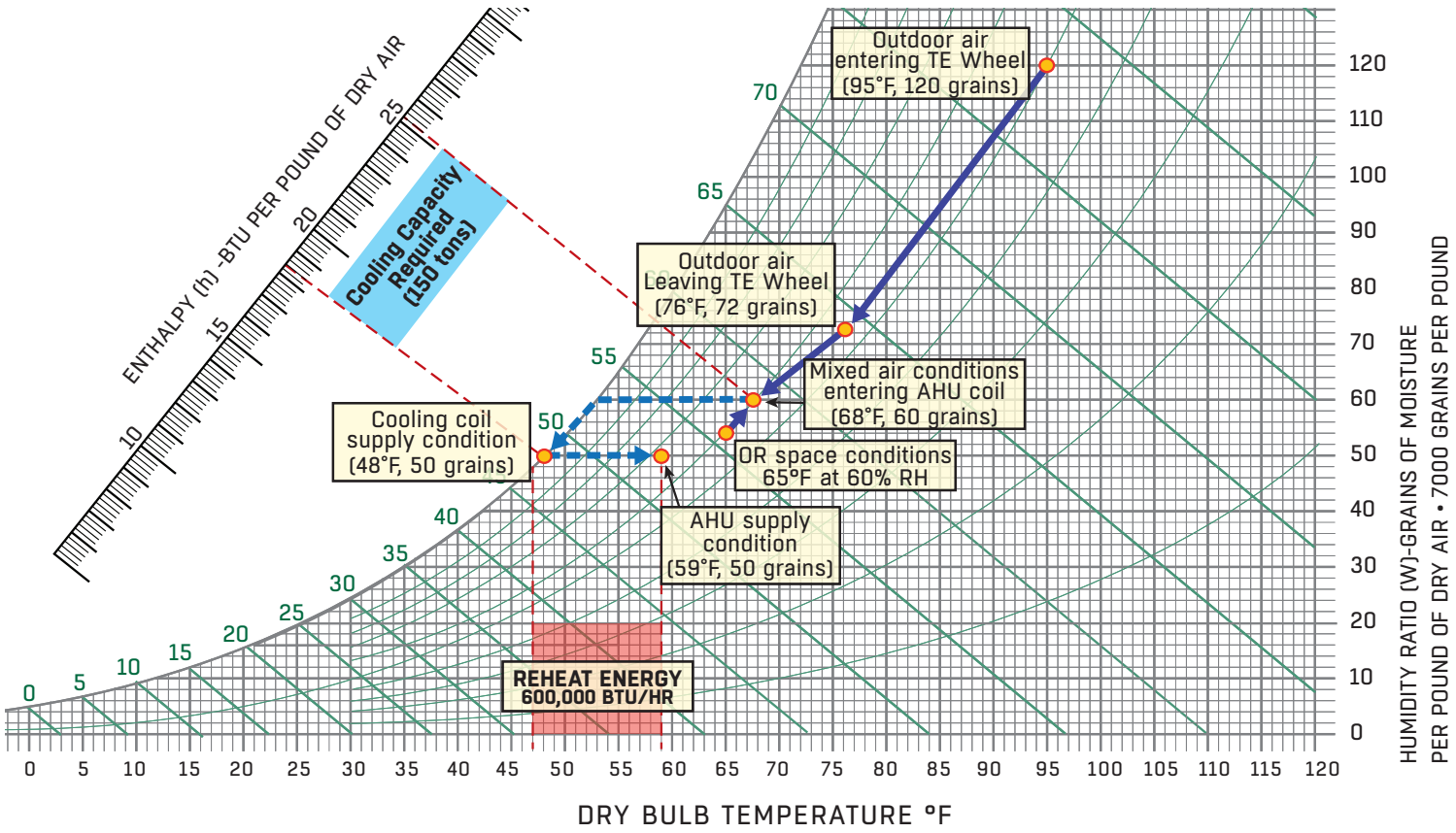
Operating Theater Design Analysis:
Conventional vs. Ascendant

Example: Fifteen operating rooms designed in accordance with FGI/AIA/ASHRAE guidelines requiring 3,333 cfm each using 20% outdoor air

Case 1: Total Energy preconditioning to Conventional AHU

- Operating theaters conditioned to achieve 65°F and not more than 60% RH as required for Delivery Rooms by AIA/ASHRAE guidelines
- Coldest possible chilled water used (40°F at the chiller), and deepest cooling coil (10 row) to achieve 48°F air off of the coil
- Air reheated to 59°F to accommodate sensible load in the space
- Total energy recovery is utilized to precondition the outdoor air portion as per ASHRAE 90.1
- Preconditioned air (10,000 cfm) is delivered to conventional AHUs supplying enough air to provide 3,333 cfm to each of the 15 operating rooms to achieve the required 25 air changes/Hr.

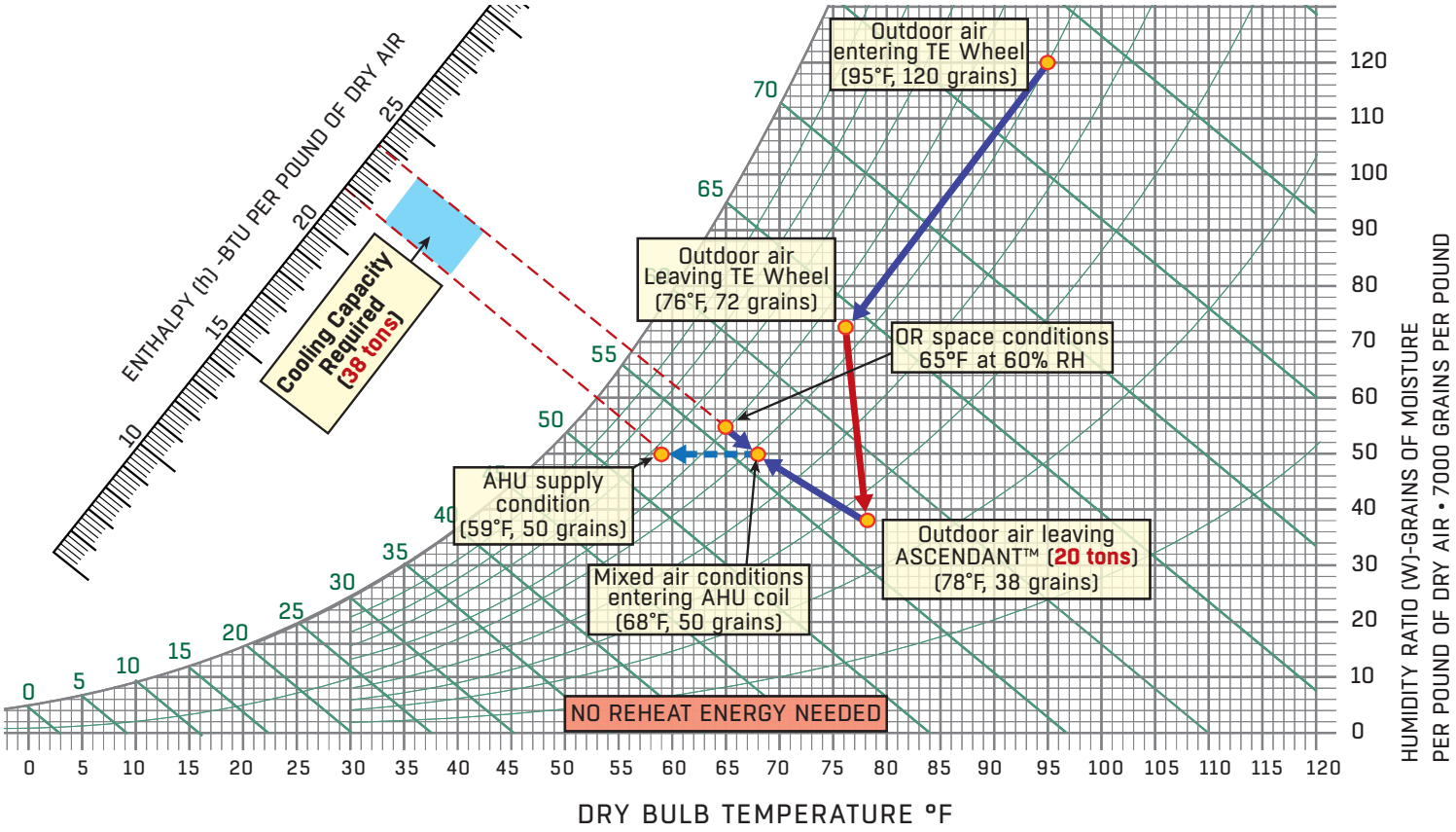
Conventional Approach: Requires 150 Tons, 600K BTU Reheat



Case 2: Ascendant preconditioning to Conventional AHU

- Operating theaters operated in an attempt to achieve 65°F and 60% RH as required for Delivery Rooms by AIA/ASHRAE guidelines (Note: Colder room conditions—often desired for surgeon comfort—and lower space humidity can be easily achieved with Ascendant)
- Traditional chilled water used (45°F at the chiller), thereby increasing chiller efficiency and sensible only cooling coil (4 row) in AHUs
- No reheat required to deliver the 59°F to the space
- Total energy recovery is utilized to precondition the outdoor air portion as per ASHRAE 90.1 combined with integrated active desiccant to deliver very dry outdoor air to each AHU. All latent load handled by Ascendant so AHU coils are sensible only

Ascendant Approach: Requires only 58 Tons, No Reheat



System Comparison:
Conventional vs. Ascendant

	Case 1: Conventional	Case 2: Ascendant Preconditioning
Outdoor Air Preconditioning		
Airflow provided (for ten ORs)	10,000 cfm	10,000 cfm
Pretreatment used	Total energy recovery	Total recovery, pre-cooling, active dehumidification
Cooling capacity required (at peak)	None required	20 tons[1]
Regeneration capacity required (at peak)	None required	352,000 btu/hr
Supply Air		
Airflow provided	50,000 cfm	50,000 cfm
Outdoor air percentage	20%	20%
Cooling capacity required	150 tons[2]	38 tons[1]
Chilled water temperature required	40˚F	45˚F
Reheat energy required	594,000 btu/hr	None required
Total System Summary		
Cooling capacity required	150 tons[2]	58 tons[1]
Reheat/regeneration energy required	594,000 btu/hr	352,000 btu/hr (peak, less at part load)
Total fan HP estimate	59 BHP	62 BHP
Dehumidification season cooling electrical cost[3] ($.08/KWH)	$32,312	$11,190
Dehumidification season heat ($10 MMBTU)	$21,408	$12,900
Total Energy Cost Estimate (Dehumidification season)	**$53,720**	**$24,090**

[1] Reflects higher chiller efficiency with 45˚F water.

[2] Reflects lower chiller efficiency with 40˚F water.

[3] Assumes Philadelphia weather data, 24 hour/day operation, $.08/KWH, $10/MMBTU steam

Results from Example Analyses

Numerous important design advantages were recognized when the outdoor air was preconditioned by the Ascendant technology. When compared to the conventional approach, the Ascendant system achieved the desired space humidity conditions using 61% fewer tons of cooling capacity (58 vs 150), eliminated approximately 600,000 BTUs of reheat energy and cut the cost of operation by 55%.

The cooling efficiency is improved with Ascendant since the desired air temperature leaving the coil could be achieved using traditional 45˚F chilled water while the conventional approach needed chilled water at 40˚F or below. Chillers operated to deliver 40˚F require substantially more energy input (KW/ton) then do chillers delivering water at 45˚F. Ascendant solves the problem of delivering these chilled water conditions to an entire facility simply because they are needed in a certain area.

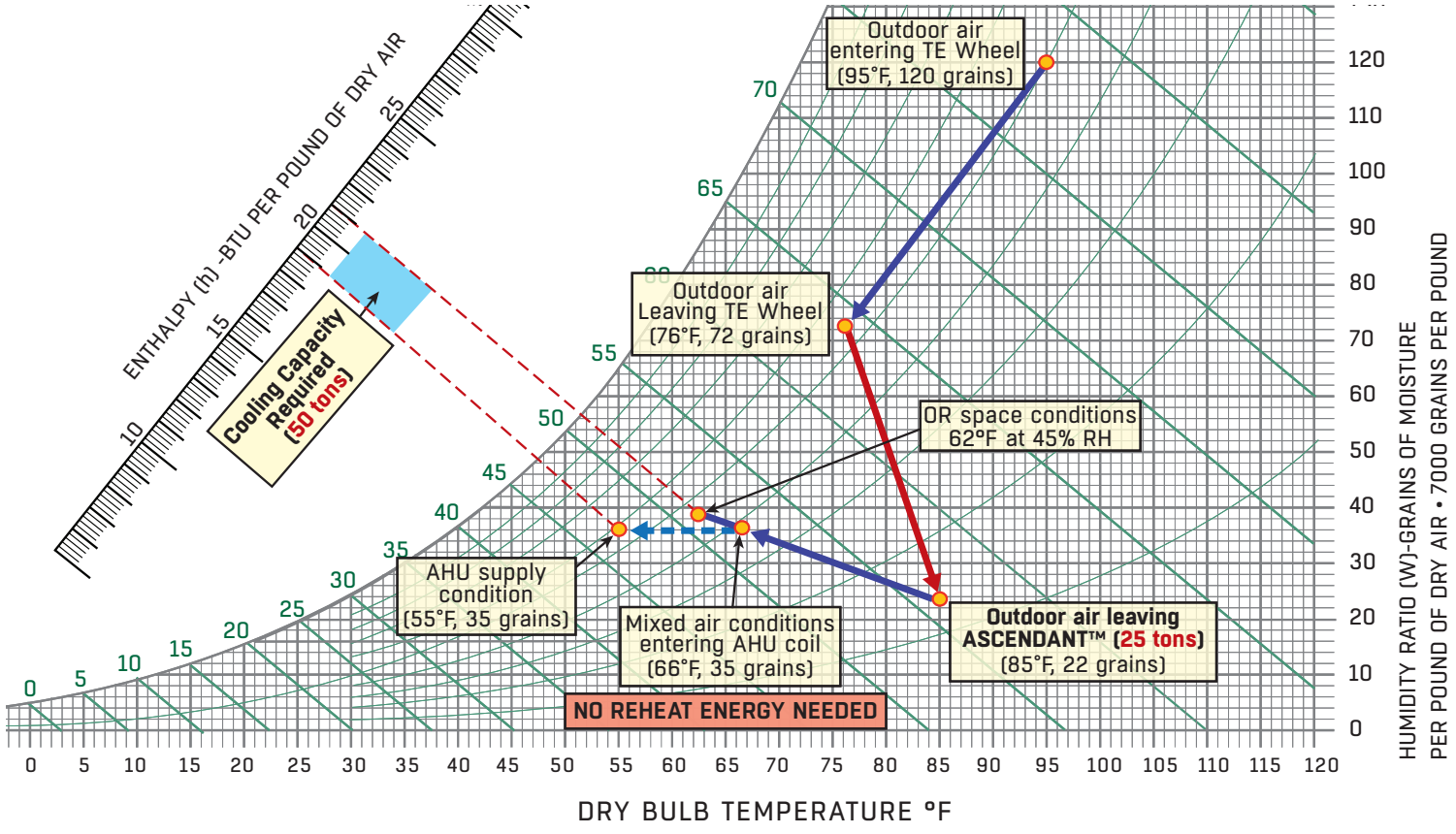
ASCENDANT™

Case 3: Ascendant Exceeds AIA guidelines at the Desired Space Temperatures

Perhaps the greatest benefit offered by the Ascendant technology is the additional dehumidification capacity provided so that HVAC systems are able to meet the required space humidity conditions even when space temperatures colder than 65˚F are desired. High lighting intensity and machinery combined with protective clothing typically requires space temperatures at or below 62˚F for comfort during strenuous tasks.

Another key reason for providing additional dehumidification capacity is to accommodate latent loads infiltrating from higher humidity spaces adjacent to the space. Experience has shown that these latent loads are often missed during the design process which is problematic since they are significantly greater than those associated with the occupants.

As shown within the Case 3 psychrometric chart (below), Ascendant can easily maintain space conditions down to 62˚F and below while achieving the desired 50% relative humidity level. This is possible due to the Ascendant system's ability to deliver air with a dew point as low as 20˚F. Surprisingly, these conditions can be efficiently maintained without the need for substantially more cooling or regeneration energy input than required by Case 2 and substantially less than required by the conventional approach shown in Case 1.



STANDARDS AND OPTIONS

STANDARD FEATURES

Active Desiccant Wheel

- Fluted media composed of porous inorganic fiber impregnated with high quality adsorbent
- Driven using lube-free chain for longevity and ease of maintenance

Active Desiccant System

- DX or chilled water pre-cooling coils
- Regeneration heat - hot water, steam, electric, or gas (indirect and direct)
- Wheel bypass damper lowering wheel pressure drop and providing greater control over supply temperature and humidity

SEMCO PANL Solutions

- Double-wall panel construction (4 inches thick with 18-gauge outer skin)
- Double-wall removable panels provided for large internal components
- Gasketed double-wall access doors for all compartments

Supply and Regeneration Air Fans

- Direct drive plenum supply and SWSI regeneration fans
- Variable frequency drives

Filter Sections

- 30 percent efficient filters are provided for supply and regeneration air streams

OPTIONAL FEATURES

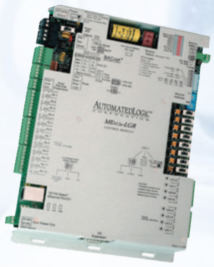
- Recirculation damper to allow regeneration heat source to be used for supply air during winter operation
- Post-cooling coil if cooler supply air is required
- Process Heating
- MERV 11-14, HEPA, and ULPA high efficiency final filters on supply side
- Return fan for partial outdoor air systems
- Total energy recovery wheel when exhaust air is available to reduce required cooling input
- Custom options and configurations are supported to meet your unique requirements

DDC CONTROLS

Advanced integrated DDC controls are utilized to optimize the performance of Ascendant to achieve the desired supply air humidity and temperature conditions while minimizing energy consumption.

Five standard parameters that are controlled:

1. The fraction of the supply airflow that is processed by the active dehumidification wheel and the integral modulating bypass damper
2. The temperature of the air leaving the pre-cooling coil
3. The regeneration energy used (temperature)
4. The supply airflow delivered
5. The regeneration airflow utilized



UNIT SIZES AND DIMENSIONS

Unit Size	Airflow CFM Range	Unit Height	Unit Width	Make up Air Unit Length	Dedicated Outside Air System with True 3Å Wheel Unit Length	Total Conditioner Unit Length
005	2,720 - 5,500	62”	102.25”	259”	364.5”	351”
009	3,740 - 8,500	74”	114.25”	259”	380.5”	358.75”
013	6,130 - 10,500	88”	114.25”	263”	402.25”	360.75”
018	7,600 - 15,000	100”	138.25”	274.25”	420”	368.75”
024	9,600 - 20,000	112”	150.25”	297.75”	462.5”	387.5”

DELIVERING AIR DEHUMIDIFIED OVER A WIDE RANGE TO HANDLE FLUCTUATIONS IN LATENT LOADS.

A VARIETY OF APPLICATIONS

Ascendant is ideal for hospital operating rooms and much more! Delivering extremely dry outdoor air to manage the heavy infiltration load in hot/humid locations, Ascendant improves comfort while extending the life of furnishings and greatly reducing the risk of mold and mildew.

Comfort with Low Dewpoint: Hospital Operating Theaters

To minimize reinfection and maximize comfort, commonly hospitals require operating rooms to be controlled at 50% relative humidity down to 62°F. This equates to a dew point of 42°F in the space.

Most hospitals operate with chilled water systems and these conditions cannot be achieved using chilled water alone.

Hospitals operate chillers inefficiently, at great operating expense, to produce the coldest possible chilled water while still not achieving the required humidity levels.

Ascendant can deliver the low dew point air necessary to below the 50% RH at 62°F while allowing the chiller to operate at its optimum efficiency level, delivering 45°F water.

Dry air storage: Warehouse, Cave Storage

To preserve products, avoid rust and prevent condensation, the need for cooling and heating of dry air storage spaces can be avoided if effective active dehumidification is employed.

Relative humidity is a function of both moisture and temperature. Unheated warehouses and cave storage result in high RH conditions and potential condensation.

Warm, very dry air delivered by Ascendant can substantially reduce your operation costs.

Tight Humidity Control: Archives, Museums, Libraries

Archives, museums and libraries exist to preserve documents and artifacts avoiding any preventable, premature damage.

HVAC systems can significantly impact the life of the items you are trying to preserve by consistently maintaining the RH at approximately 50% with swings over time. Humidity spikes can accelerate damaging chemical reactions and biological attack.

Ascendant systems with post cooling can carefully track space conditions and precisely control them to consistent levels due to the high dehumidification capacity and advanced DDC controls.

Drying Ventilation Air: Hotels/Condominiums

There is a very high latent load associated with ventilation air and infiltration in hotels and condominiums located in humid climates.

Ascendant can effectively deliver outdoor air at very low dew points allowing the ventilation air alone to control space humidity regardless of the internal sensible load.

By deep drying the ventilation air, the packaged cooling units can be downsized, reducing the size of ductwork, noise produced, and energy consumption.

Since the ventilation airflow is provided continuously, Ascendant provides substantial dehumidification even on cloudy, humid days when the call for space cooling is minimal.

Low Dew Point Spaces: Food Processing, Manufacturing

To minimize moisture and condensation in production areas, Ascendant provides an efficient solution. Unwanted moisture can make equipment under-perform, create hygiene concerns, and violate USDA codes, costing you money.

Ascendant will give you peace of mind that your product will be protected in every step of its journey from production to storage, improving product quality and reducing waste.

Condensate Avoidance: Chilled Beam Installations

Active or passive chilled beam designs are most energy efficient when system fans are sized to deliver only outdoor ventilation air.

Handling the latent load associated with people and infiltration with the outdoor air volume alone often requires dew points lower than what is achievable with conventional systems.

Space humidity needs to be controlled well below the dew point of the water temperature delivered to the beams to avoid condensation. Ascendant can process three times the latent load of a custom refrigeration based DOAS allowing it to prohibit beam condensation using the minimum possible outdoor air quantity.

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EXCELLENCE IN SOLUTIONS

FläktGroup® SEMCO® delivers smart and energy efficient Indoor Air and Critical Air solutions to support every application area. We offer our customers innovative technologies, high quality and outstanding performance supported by more than fifty years of accumulated industry experience. The widest product range in the market, and strong market presence in 65 countries worldwide, guarantee that we are always by your side, ready to deliver Excellence in Solutions.

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