FläktGroup®

SEMCO®

ENERGY EFFICIENT

DEHUMIDIFICATION

PINNACLE® SERIES

DEDICATED OUTDOOR AIR SYSTEM
SALES BROCHURE

THE PINNACLE® SERIES

PROVIDES VERY DRY OUTDOOR AIR IN A SIMPLE, ENERGY-EFFICIENT INTEGRATED PACKAGE

The Pinnacle® Series manages 100% of a building's humidity, temperature and ventilation in a single package. It's the only ventilation system you will ever need.

HOW DOES IT WORK?

The Pinnacle® Series combines the strengths of passive total energy recovery, conventional cooling technology and a new class of desiccant product — the passive dehumidification wheel — to supply perfect ventilation.

The Pinnacle® Series is comprised of a supply fan, exhaust fan, total energy wheel, coil(s), passive dehumidification wheel, and variable speed compressor. The total energy wheel is used to precondition fresh air using the exhausted building air. The coils and passive dehumidification wheel then work in concert to further treat this fresh air stream to produce room temperature air at a much reduced humidity level.

The key to this system is the passive dehumidification wheel. It is optimized to remove moisture from a saturated air stream, without an active regeneration source.

UNPRECEDENTED EFFICIENCY

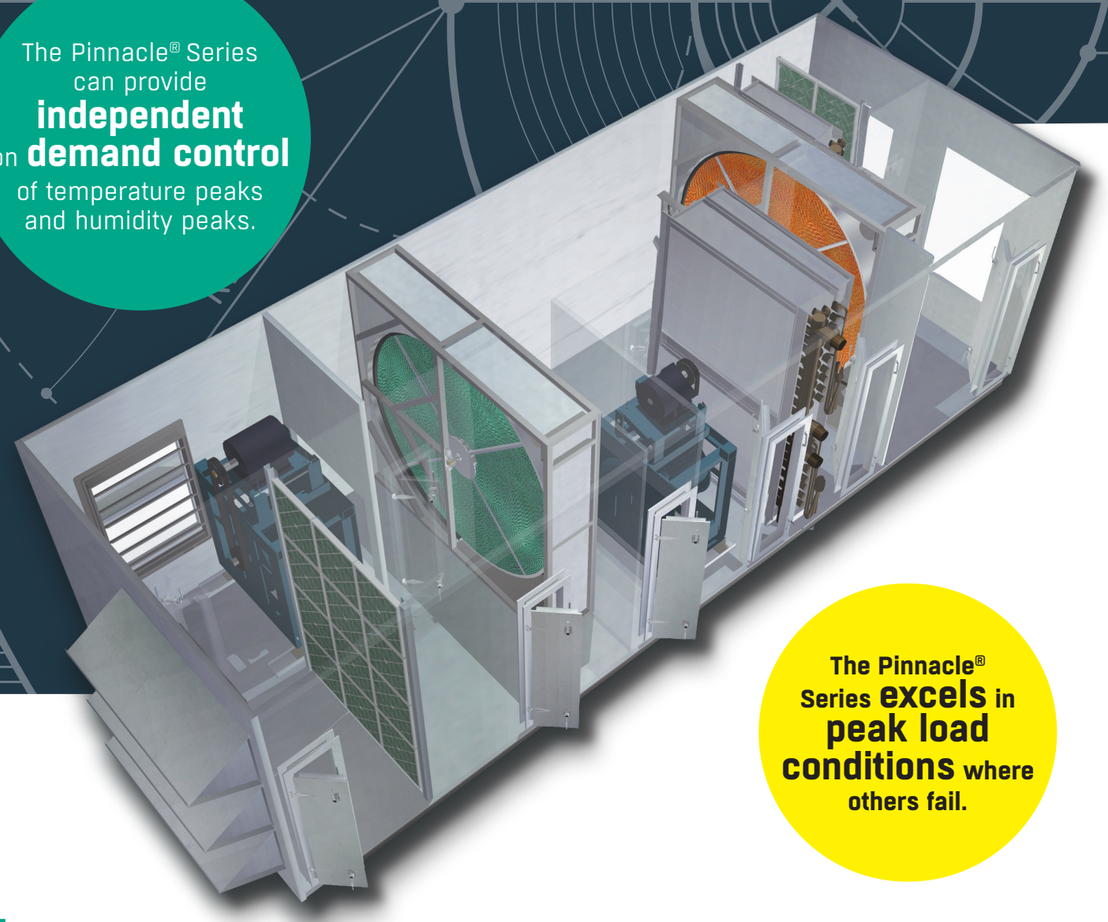
The Pinnacle® Series responds to various combinations of temperature and humidity by modulating the passive dehumidification wheel and the cooling coil. The Pinnacle® Series then provides a constant stream of optimally conditioned ventilation air while exhausting your building's stale, polluted air. It does so in a highly efficient manner, providing substantial operating savings by eliminating the need for traditional over-cooling and reheat systems. Equally important, by optimizing the condition of your building's supply air, the Pinnacle® Series reduces the demand for overall heating and cooling capacity. That can mean substantial savings in installation costs.

THE TRUE 3Å™ ADVANTAGE

Inside every Pinnacle unit is the True 3Å™ energy recovery wheel. The True 3Å™ wheel, has saved an estimated 603 trillion BTUs and reduced carbon emissions by more than 34-million tons over the past 32 years. The True 3Å™ desiccant is a key contributor to a building's indoor air quality, allowing less than .045% contaminant transfer into the supply airstream according to independent testing.

HOW IT WORKS

The Pinnacle® Series can provide **independent** on **demand control** of temperature peaks and humidity peaks.



The Pinnacle® Series excels in peak load conditions where others fail.

- The passive dehumidification wheel's performance can be modulated on demand to respond to various outdoor conditions of temperature and humidity.
- In the cooling season, the Pinnacle® Series can control temperature peaks and humidity peaks independently. in the heating season, it can recover up to 90% of the heating season, it can recover up to 90% of the heating energy from a building's exhaust airstream.
- The True 3Å™ total energy recovery wheel has aluminum media with a high-performance, 3Å molecular sieve desiccant.
- Energy input to the cooling coil is adjusted on demand.

COMMON TEMPERATURE ISSUES

At any given time, your building could be faced with one of the following conditions:

- The building is too hot, although the humidity is acceptable.
- The building is too hot and too humid.
- The building is too cool and too humid.
- The building is too cool, although the humidity is acceptable.

The Pinnacle system responds to these varying conditions on demand. It cools, heats, or dehumidifies as required, providing a steady stream of optimally pre-conditioned air to your building. It will allow constant ventilation of your work space for superior air quality. And it provides maximum comfort level at minimal energy cost.

THAT'S INTELLIGENT.

HOW THE PINNACLE SOLVES THESE ISSUES

Pinnacle offers several advantages over other systems:

- Dehumidification of the supply air can be greatly increased.
- Energy efficiency is greatly increased.
- It controls humidity in unoccupied spaces.
- During the heating season, it can recover up to 90% of the energy from the building's exhaust airstream.

THE **ONLY** VENTILATION SYSTEM YOU WILL **EVER NEED**

FEATURES & BENEFITS
THE PINNACLE® SERIES

THE TRUE 3Å™ TOTAL ENERGY WHEEL

- Total energy recovery performance (sensible and latent) up to 90% efficient.
- For your most critical applications, patented 3Å molecular sieve-desiccant coating avoids cross-contamination.
- Most reliable wheel performance. No SEMCO wheel has ever failed an AHRI test.
- Wheel faces are coated to ensure long lasting corrosion protection.
- Structural aluminum, spoke system eliminates mechanical fatigue and allows media replacement (sizes 13 and up).
- Non-wearing labyrinth seals (sizes 13 and up)
- Equal latent and sensible heat transfer enthalpy wheel
- Passive dehumidification wheel is polymer coated to avoid oxidation and future transferring of moisture.
- Independently certified wheel performance in accordance with AHRI 1060 standards with regard to: latent heat transfer efficiency, sensible heat transfer efficiency, and pressure loss across the wheel.
- Wheel media independently certified to pass NFPA 90A requirements for flame spread and smoke generation based upon ASTM E84 fire test.
- Minimal maintenance

SEMCO PANEL SYSTEM

- Double-wall panel construction (2 or 4 inches thick with 18-gauge outer skin) eliminates exposed insulation and the associated risk of bacterial growth.
- Double-wall removable panels provided for large internal components.
- Gasketed double-wall access doors for all compartments.
- Sloped secondary roof of continuous standing-seam panels standard on units designed for outdoor installation.
- Welded enclosure aluminum treadplate floor with insulated drain pan.

SUPPLY AND EXHAUST AIR FANS

- AMCA - rated plenum fans sized for quiet and efficient operation.
- Fans mounted, balanced, tested and internally isolated for vibration.
- Fan motors are NEMA frame, high-efficiency with a 15% service factor

FILTER SECTIONS

- Filters that are 30% (MERV 8) efficient are provided for the outdoor air and return airstreams.
- Optional 65, 85 or 95% (MERV 11, 13, 14) cartridge filters in addition to standard 30% filter are available.
- Optional HEPA filters for hospital applications are available.

HOODS AND DAMPERS

- Low-leakage motorized fresh air damper and gravity exhaust air damper
- Outdoor units provided with an intake and exhaust hood with bird screen
- Optional motorized exhaust damper available
- Optional recirculation damper available

ELECTRICAL PACKAGE WITH SINGLE POINT CONNECTION

- Power distribution panel with non-fused disconnect and branch circuit protection for each motor and transformer.
- Motors are wired to soft starters or variable frequency drives (VFDs).
- Custom control packages available
- 208V/3/60 or 480V/3/60 single-point connections available.
- 575V single-point connection available upon request.

VARIABLE SPEED WHEEL CONTROL

- Digital reading of temperatures
- Proportional heating control
- Automatic summer/winter changeover

REHEAT OPTIONS

- Hot water coil
- Non-freeze steam coil
- Electric coil (requires separate electrical connection point)
- Indirect gas furnace

COOLING OPTIONS

- Chilled water
- Direct expansion (DX) coil

THE PINNACLE I® SYSTEM

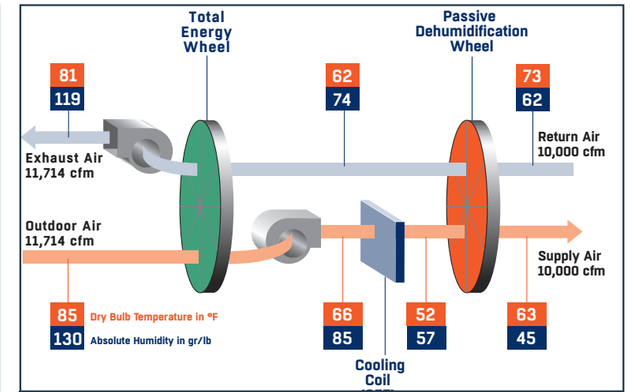
THE PINNACLE I® SYSTEM AIRFLOW CAPACITIES

	PVS MODEL	PVS-03	PVS-05	PVS-09	PVS-13	PVS-18	PVS-24	PVS-28	PVS-34	PVS-43
AIR CAPACITY	LOW	2,000	3,000	4,500	6,000	8,000	11,000	15,000	18,000	26,000
	MID	2,250	3,500	6,000	7,500	10,000	13,000	18,500	21,000	30,000
	HIGH	2,500	4,000	7,300	8,800	14,000	15,000	21,000	24,000	37,000

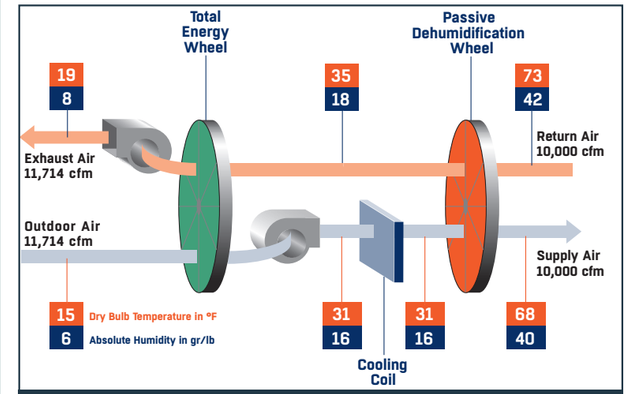
PINNACLE PRIMARY VENTILATION SYSTEM

KEY BENEFITS - PINNACLE I® SYSTEM

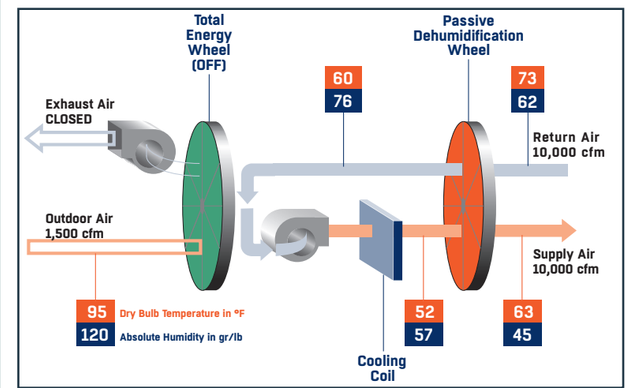
- Most efficient system on the market today, with the best humidity control under all conditions.
- Highest performing wheel on the market.
- Able to dehumidify outdoor air as low as 40 grains — dew points unattainable with conventional systems.
- Competitive first cost, up to 3 times the latent load capacity versus competitive units.
- Lowest operating cost, best life cycle cost on the market today.
- Features an optional unoccupied run mode — evenings, weekends, and summer.
- Pre-cools and dehumidifies outdoor air during the cooling season.
- During the cooling season, significantly reduces the required cooling input by pre-cooling and dehumidifying the outdoor air.
- Preheats and pre-humidifies the outdoor air during the heating season.
- Supplies preconditioned outdoor air to conventional HVAC systems, allowing them to effectively increase outdoor air percentages.
- Preconditioned outdoor air can be introduced to the return air plenum, serving a central HVAC system.
- Can be supplied directly to the conditioned space since the system's recovery efficiency ranges between 74% - 85% (in balanced flow operation).
- Most reliable wheel performance. No SEMCO wheel has ever failed an AHRI certification test.
- Independently certified wheel performance in accordance with AHRI 1060 standards with regard to: latent heat transfer efficiency, sensible heat transfer efficiency, pressure loss across the wheel.
- Equal latent and sensible heat transfer enthalpy wheel.
- Wheel media independently certified to pass NFPA 90A requirements for flame spread and smoke generation based upon ASTM E84 fire test.
- Field-adjustable purge section.
- Minimal maintenance



Operating at peak space latent load providing 70.1 tons of total cooling at a sensible heat ratio (SHR) of 0.27 using only 33.8 tons of refrigeration input. The dew point delivered to the space is 45.4°F. A conventional system with the same leaving coil temperature will NOT deliver the same dew point. It would require 81.1 tons of refrigeration and 156 MBtuh to achieve the same leaving coil condition.



Operating in heating mode providing 573 MBtuh of energy and 219 MBtuh of humidification.



Operating in unoccupied mode. The system can operate in 100% recirculation mode and with very little refrigeration input effectively controlling the indoor humidity, to comply with ASHRAE 62.1 addendum ae.

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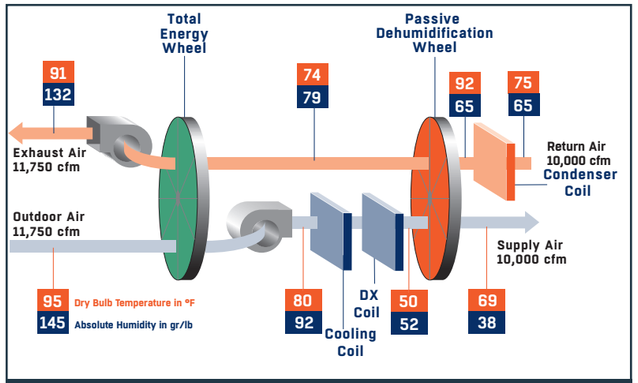
THE PINNACLE II® SYSTEM

THE PINNACLE II® SYSTEM AIRFLOW CAPACITIES

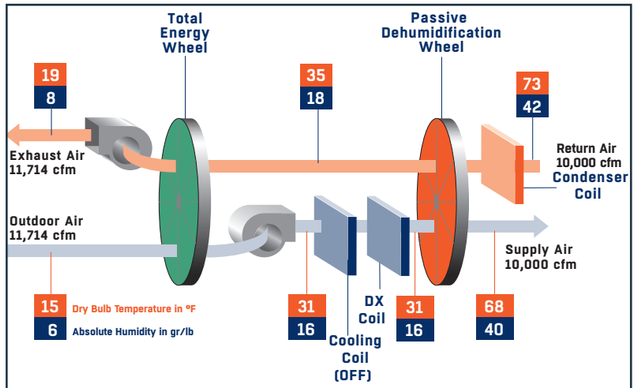
	PVSII MODEL	PVSII-05	PVSII-09	PVSII-13	PVSII-18	PVSII-24
AIR CAPACITY	LOW	3,000	4,500	6,000	8,000	11,000
	MID	3,500	6,000	7,500	10,000	13,000
	HIGH	4,500	8,000	10,000	15,000	18,000

KEY BENEFITS - PINNACLE II® SYSTEM

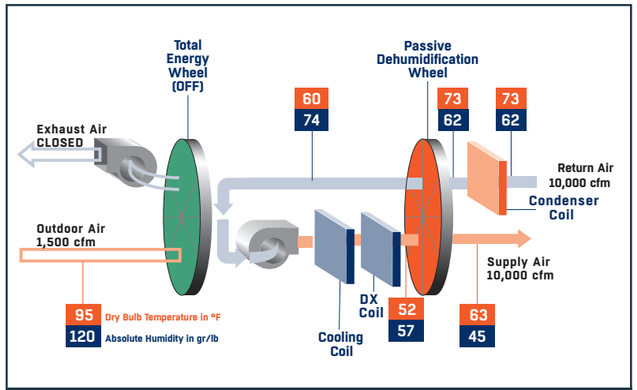
- The lower return air RH condition enhances dehumidification performance (lower dew point or less cooling input required) — 10 to 25% increase in dehumidification capacity using the same leaving chilled water coil temperature versus the Pinnacle I®.
- The Pinnacle II® system allows conventional, and even anemic chilled water temperatures to be used in conjunction with the integrated, variable speed DX circuit to deliver supply air dewpoints as low as 35 grains. As a result the Pinnacle II® delivers far more outdoor air dehumidification capacity than any other system available and does so using the least amount of energy.
- Does not require remote condensing section for DX trim coil addition.
- Features a variable speed compressor that optimizes temperature control.
- Part load dehumidification can often be accomplished with the second DX trim coil.
- Competitive first cost, that provides up to 3 times the latent load capacity versus competitive units.
- Lowest operating cost, best life cycle cost on the market today.
- Features an optional unoccupied run mode — evenings, weekends, summer.
- Pre-cools and dehumidifies outdoor air during the cooling season.
- Preheats and pre-humidifies the outdoor air during the heating season.
- Suitable for new construction and can be retrofitted to most existing facilities.
- Supplies pre-conditioned outdoor air to conventional HVAC systems, allowing them to effectively increase outdoor air percentages.
- Pre-conditioned outdoor air can be introduced to the return air plenum, serving a central HVAC system.
- Can be supplied directly to the conditioned space since the system's recovery efficiency ranges between 74%-85% (in balanced flow operation).
- The higher return air temperature provides for warmer supply air despite low leaving coil conditions used to achieve low dew points from the system.
- The increased return air temperature allows for a wide imbalance between supply and return airflows for pressurization purposes without causing condensation issues nor limiting dehumidification performance.



Operating at peak space latent load providing 88 tons of total cooling, and more importantly, 61 tons of latent cooling (0.26 sensible heat ratio) using only 41 tons of chilled water for the stage 1 cooling (total of 54 tons, including integrated stage 2 DX circuit). The system delivers supply air at a 41 degree dewpoint (38 grains). This is accomplished using traditional chilled water temperatures. A conventional system would require approximately 135 tons of installed compressor capacity and 300,000 BTU/Hr of reheat energy.



Operating in heating mode providing 573 MBtuh of energy and 231,000 MBtuh of free humidification.



Operating in unoccupied mode. The system can operate in 100% recirculation mode and with very little refrigeration input effectively controlling the indoor humidity, to comply with ASHRAE 62.1 addendum ae.

COMPARISONS

SIDE-BY-SIDE TECHNOLOGY COMPARISON

The two most significant advantages offered by the Pinnacle system, when compared with the traditional over-cooling and reheat systems, are that (1) the dehumidification or latent capacity (e.g., dryness of the air provided to the controlled space) is significantly increased and (2) the energy efficiency is greatly improved. The Pinnacle system has more latent capacity and higher energy efficiency than an active desiccant-based cooling (DBC) or a dual-wheel energy recovery system (DWERS).

For example, an active DBC system processing outdoor air on a peak design day (85°F and 130 gr/lb) is limited to a supply air condition of approximately 60 grains with technology currently available. To reach this condition requires the equipment to be operated at very low face velocities (resulting in very large system space requirements) and regenerated at very high regeneration temperatures (large energy).

The DWERS and other conventional over-cooling reheat systems are limited by the dew point of the air leaving the cooling coil. Since most conventional cooling systems have a practical limit of approximately 48°F air temperature leaving the cooling coil, the absolute humidity level obtainable from most conventional systems is about 50 grains per pound of moisture.

As a result, the only commercially available way to dehumidify outdoor air below approximately 50 grains of moisture involves cooling the outdoor air below approximately 48°F, and requires expensive, non-standard cooling equipment with very deep cooling coils, complex controls with defrost cycles and significantly elevated kW/ton energy consumption (eg. poor energy efficiency).

COMPARING ENERGY CONSUMPTION AND COOLING REQUIREMENTS AT COMMON DELIVERED DEW POINTS

EQUIPMENT OPTIONS	DEW POINT DELIVERED	LATENT CAPACITY DELIVERED	CONVENTIONAL COOLING CAPACITY REQUIRED	REHEAT REQUIRED	ENERGY BASELINE
PACKAGED ROOFTOP GAS REHEAT	51° F	42.5 TONS	75.8 TONS	166,100 BTU/HR	100%
CHILLED WATER/ HOT WATER REHEAT	51° F	42.5 TONS	75.8 TONS	166,100 BTU/HR	100%
CUSTOMIZED PACKAGE DX WITH CONDENSER REHEAT	51° F	42.5 TONS	75.8 TONS	0 BTU/HR	85%
ACTIVE DESICCANT BASED COOLING	55° F	36.8 TONS	18.9 TONS	489,000 BTU/HR	70%
TOTAL ENERGY RECOVERY CHILLED WATER WITH HOT WATER REHEAT	51° F	42.5 TONS	37.5 TONS	166,100 BTU/HR	57%
DUAL WHEEL ENERGY RECOVERY SYSTEM	51° F	42.5 TONS	29.5 TONS	0 BTU/HR	33%
PINNACLE "PASSIVE DEHUMIDIFICATION SYSTEM	**51° F**	**42.5 TONS**	**24 TONS**	**0 BTU/HR**	**27%**

LOWEST COOLING INPUT TO PRODUCE 42.5 TONS OF LATENT LOAD

LOWEST DEW POINT AND **20% MORE** TOTAL LATENT CAPACITY THAN THE OTHER OPTIONS

COMPARING FIRST COST, OPERATING COST AND LIFE CYCLE COST AT LIKE DEW POINTS

EQUIPMENT OPTIONS	LATENT CAPACITY DELIVERED	EQUIPMENT COST	ANNUAL COST OF OPERATION	LIFE CYCLE COST
PACKAGED ROOFTOP GAS REHEAT	42.5 TONS	$56,500	$24,045	$610,020
CHILLED WATER/ HOT WATER REHEAT	42.5 TONS	$63,000	$20,130	$514,960
CUSTOMIZED PACKAGE DX WITH CONDENSER REHEAT	42.5 TONS	$66,000	$21,920	$556,370
ACTIVE DESICCANT BASED COOLING	36.8 TONS	$87,000	$12,240	$332,250
TOTAL ENERGY RECOVERY CHILLED WATER WITH HOT WATER REHEAT	42.5 TONS	$60,500	$11,290	$300,490
DUAL WHEEL ENERGY RECOVERY SYSTEM	42.5 TONS	$61,500	$4,465	$146,330
PINNACLE "PASSIVE DEHUMIDIFICATION SYSTEM	**42.5 TONS**	**$65,300**	**$3,420**	**$119,050**

LOWEST ANNUAL OPERATING COST — **ONLY 14%** OF THE BASELINE SYSTEM

LOWEST LIFE CYCLE COST — **$490,000 LESS** THAN THE BASELINE SYSTEM

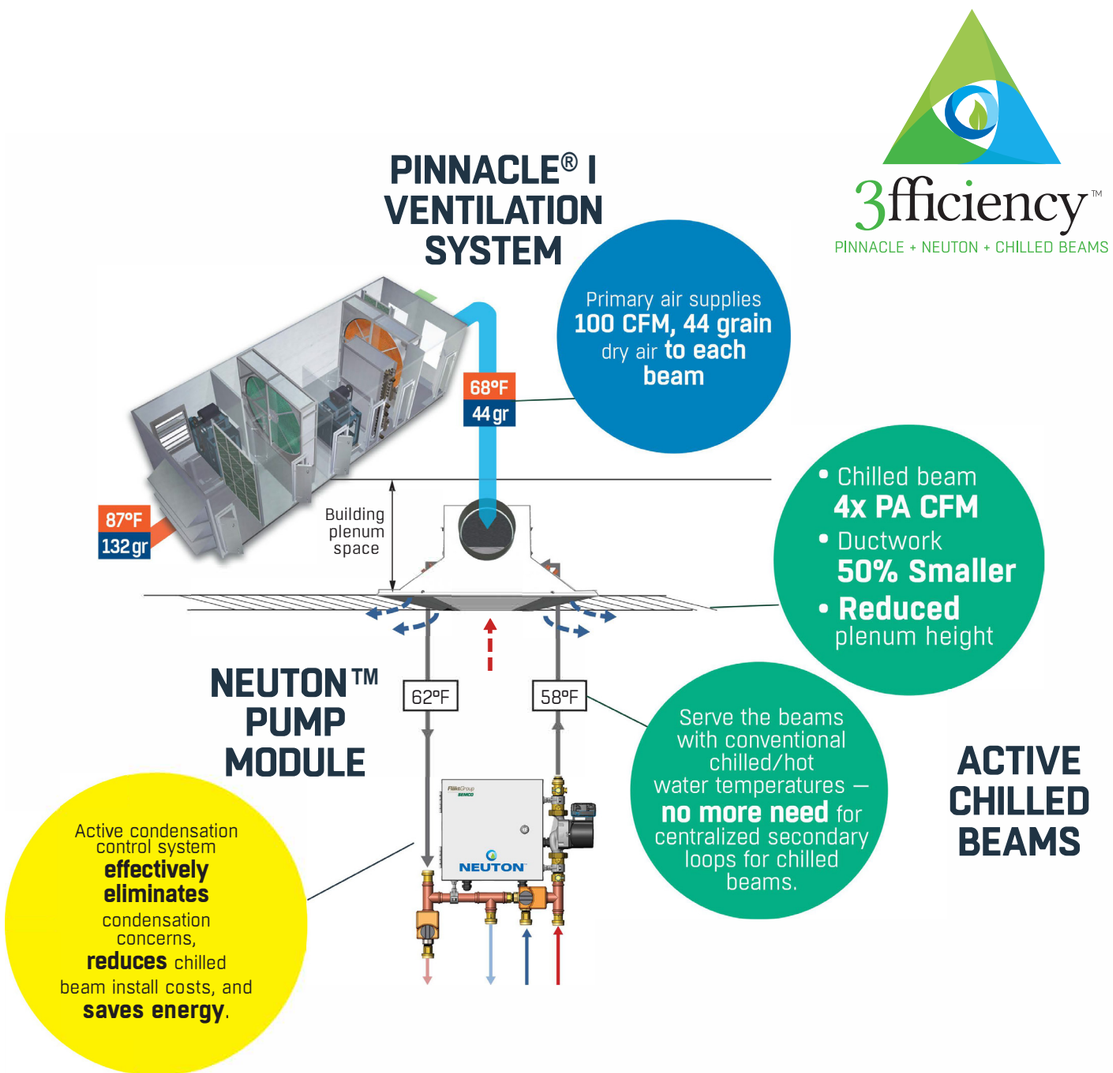
LOWEST FIRST COST PER TON OF LATENT LOAD PROVIDED

COMPARING LATENT CAPACITY PROVIDED AT ATTAINABLE DEW POINTS

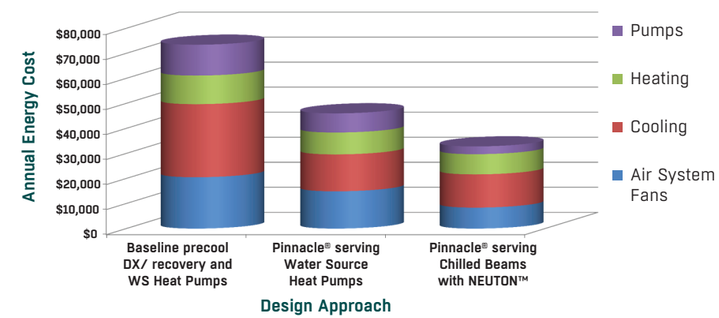
EQUIPMENT OPTIONS	LOWEST PRACTICAL DEW POINT DELIVERED	HUMIDITY LEVEL DELIVERED	LATENT CAPACITY (OUTDOOR LOAD)	LATENT CAPACITY (ROOM LOAD)
PACKAGED ROOFTOP GAS REHEAT	51° F	55 GRAINS	43 TONS	6 TONS
CHILLED WATER/ HOT WATER REHEAT	49° F	52 GRAINS	44 TONS	7 TONS
CUSTOMIZED PACKAGE DX WITH CONDENSER REHEAT	50° F	54 GRAINS	43 TONS	6 TONS
ACTIVE DESICCANT BASED COOLING	55° F	65 GRAINS	37 TONS	0 TONS
TOTAL ENERGY RECOVERY CHILLED WATER WITH HOT WATER REHEAT	49° F	52 GRAINS	44 TONS	7 TONS
DUAL WHEEL ENERGY RECOVERY SYSTEM	49° F	52 GRAINS	44 TONS	7 TONS
PINNACLE "PASSIVE DEHUMIDIFICATION SYSTEM	**42° F**	**40 GRAINS**	**51 TONS**	**14 TONS**

100% MORE LATENT CAPACITY AVAILABLE TO HANDLE SPACE LOADS

3FFICIENCY™
EFFICIENT HYDRONIC SYSTEM

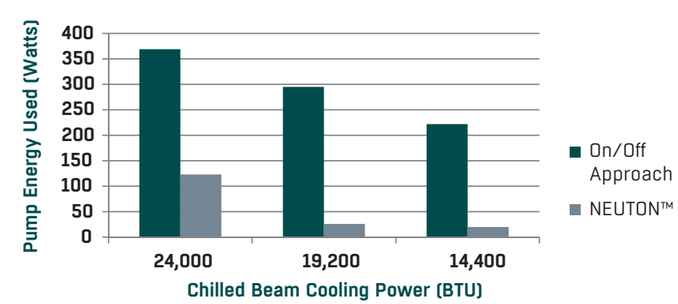


3FFICIENCY™ ENERGY SAVINGS



Energy modeling completed for a high school project comparing three design approaches which highlights the energy savings offered by the 3fficiency™ system, even over the efficient Pinnacle I® serving water source heat pumps.

VARIABLE FLOW USING HIGH EFFICIENCY PUMP VS CONVENTIONAL



Standard efficiency pump (on/off) vs high efficiency ECM variable speed pump served by the NEUTON™ pump module control logic

- The Pinnacle® Series combined with active chilled beams and the NEUTON™, chilled beam pump modules — creates a whole-building efficient hydronic system 3fficiency™. The 3fficiency™ system is uniquely designed to maximize cost savings and create superior indoor air quality, making it a better alternative to variable refrigerant flow (VRF).
- The energy savings created by employing the 3fficiency™ system are so significant that it was named to the Top 10 Green Building Products list in 2018, and it has also received recognition throughout the HVAC industry for not only being energy efficient, but also an easy-to-specify integrated system.
- A high-efficiency ECM motor combined with substantial power reduction offered by the NEUTON™ variable flow pump results in significant energy savings over traditional, constant flow — on/off approach.
- Three cooling conditions are analyzed above: peak coil cooling power (24,000 BTUs), 80% of peak (19,200 BTUs) and 60% of peak (14,400 BTUs)
- The constant speed pump operates to deliver a constant flow of 6 gpm at a 13 foot pressure head — cycled on and off during part load.
- The NEUTON™ ECM variable flow pump runs continuously, but varies the flow from 6 gpm down to 3 gpm, greatly reducing the pump energy used.

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Pinnacle® Sales Brochure - FläktGroup SEMCO 2022-10

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FläktGroup® SEMCO®
Corporate Headquarters
1800 East Pointe Drive
Columbia, Missouri 65201 USA

573.443.1481

sales.semco@flaktgroup.com

To learn more about FläktGroup® SEMCO® offerings and to contact your nearest representative please visit

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