AIRSYS

WHITE PAPER

The AIRSYS Inverter Driven Heat Pump

AIRSYS-P-WP-COM4T-INV.E2003V01.1ASCT

Table of contents

Introduction

Traditional heating and cooling solutions are a bit slow on the uptake, blasting freezing-cold air one minute and then nothing the next. So, what gives? Temperature delivery should be more consistent with less temperature swings. That's where the AIRSYS INVERTER driven technology comes in to play.

AIRSYS Refrigeration Engineering is now delivering a continuously variable heating and cooling unit for human comfort applications, using proven Variable Frequency Drive (VFD) technology. Instead of the simple and abrupt "ON" or "OFF" states, the compressor uses the AIRSYS INVERTER technology to continuously and smoothly adjust the compressor speed in response to temperature demands of the room.

AIRSYS INVERTER driven technology isn't just a variable speed drive, but it's a new technology utilizing brushless DC motors. Brushless motors eliminate electrical noise, brush wear/ residue and risks of sparking, thus greatly improving system reliability. Variable speed compression means a smoother, more streamlined approach to temperature delivery that's also lighter on the pocketbook, saving you money in reduced energy costs. The AIRSYS heat pump incorporates the highest part load efficiency in its class for even higher savings whenever less than maximum capacity is needed. The heat pump continues to perform efficiently with a Coefficient of Performance (COP) > 2.0 with the temperatures as low as 14°F. So, in most cases, there is no need for an electric strip heater at all, which has the lowest efficiency at a COP < 1.0.

What Benefits Does Inverter Technology Bring?

2.1 Total Comfort Control

Traditional systems use a fixed-speed compressor, which cycles the unit on and off whenever the room goes above, or dips below the desired set-point temperature. This system relies on an all-or- nothing philosophy—with the compressor running at either zero or 100 percent. This can lead to unpleasant temperature swings as the system strains to maintain a constant temperature via many starts and stops.

The AIRSYS inverter driven compressors, on the other hand have controls that are continuously adjusting the compressor speeds in real time, by ramping up or down power when needed. An AIRSYS inverter driven compressor provides a more accurate, on-demand approach to temperature control. For example, if the room temperature is already a comfortable 72 degrees, an inverter may slow the compressor's engine to a crawl. If the room temperature is uncomfortably warm at 80 degrees, the inverter compressor will switch into high gear, quickly returning to the comfort zone in a much more quiet manner than traditional fixed speed systems . The AIRSYS Inverter driven compressor manages the temperature fluctuation up to (≤1 °F).

The advantage of AIRSYS inverter driven heat pumps are also reflected in the rapid response to the ambient temperature, which allows the room temperature to reach the desired set point in the shortest time. When the COM4T system turns on when the room temperature is very low or too high, the AIRSYS inverter driven compressor will promptly turn on and speed up (to 120% speed) to make the room warm up or cool down quickly!

This fast response is also possible in defrost mode. In wintertime, when the air conditioner works in heating mode, the external loop coil will become frosted. In order to ensure the normal heating performance, the air conditioner will switch to defrost mode.

Traditional systems use a fixed-speed compressor that normally takes 5~10 minutes to defrost. After defrosting, the system switches back to the regular heating mode. At this moment, it normally takes another 10~15 minutes before the system being able to provide stable heating capacity. A defrosting cycle can take no more than 20 minutes, which will greatly reduce human comfort.

AIRSYS inverter driven compressors run at the highest speed to provide more heat to defrost, which can reduce defrosting within three minutes. Once the system has completed defrosting, it will immediately switch to heating mode and produce stable heating capacity within 5~10 minutes.

2.2 Dialing in Efficiency and Savings

The size of your air conditioner impacts your energy bill more than you might think. Standard, fixed-speed air conditioners will run at peak power, regardless of the size of your room—whether it's 1,000, 2,000, or 10,000 square feet. Bigger, is not necessarily better, in this case—especially if you have a smaller room. Inverter driven units, on the other hand, can dynamically adjust their compressor speeds based on a room's temperature. Because the unit only draws enough power to maintain a steady room temperature, its cooling or heating capacity adjusts to suit the needs of the room.

For fixed capacity systems each turn-on cycle requires a large in-rush current spike to get the compressor moving. Depending on how long the compressor was idle from the last cycle, it then takes time to reach peak performance. This period lasts from 1 – 5 minutes for each cycle where the machine is consuming 100% power but not delivering peak results. This is very much the same as your car engine performance. When you first turn the key, the engine consumes fuel, but you have gained no ground, which in turn is very inefficient. In fact, until the engine has been running for some time you are still consuming fuel below your expected miles-per-gallon rating.

According to AHRI, the average daily cycle for fixed capacity systems is two times per hour, or 48 times a day. This is close to 20,000 on and off cycles per year. The AIRSYS Inverter driven compressor will cut the on and off cycles by 90% to < 2,000. Less start-stop cycles = greater savings on energy consumption and eliminates wide temperature swings. With the Inverter driven compressor, there are NO in-rush currents, which will save you money on electricity and can save you money when sizing your utility power.

From an energy perspective, the inverter driven AIRSYS heat pumps have one additional significant benefit. While they meet the energy efficiency requirements for all 50 states at full speed (EER>11), the energy efficiency improves when the speed is decreased (EER up to 18 at partial load). This is one more important characteristic of the Inverter drive that reduces electricity consumption. The heating and cooling system should only be at full speed a VERY small percentage. of the time, thereby delivering energy efficiency well beyond federal, state and local requirements.

2.3 Quiet Operation

The AIRSYS inverter driven technology starts slowly. Most of the time you cannot even hear the unit come on. This is unlike traditional heat pumps where each start up can be quite startling! The AIRSYS inverter driven heat pumps were specifically designed to be quiet in all applications, but most importantly the classroom. The COM4T units have been tested and certified under 40 dBA on high speed, which is equivalent to the sound of light rain.

2.4 Reliability

With AIRSYS inverter driven compressors, soft-starts, decreased on-off cycles, all significantly reduce the wear and tear of components by slow and steady increases or decreases in speed vs. the heavy wear and tear from the dramatic on and off cycles from traditional non- inverter driven compressors.

What Other Options are Available for COM4T?

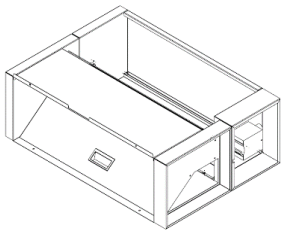
3.1 PTC Electrical Heater

The PTC electrical heater has both fast thermal response time and low inrush current. A protection device (detecting both current and temperature) will automatically cut current when unsafe levels are reached. When there is no air flow passing PTC heaters, the heaters will stop warming up. The outer edge of the PTC heating component is designed with double insulation. When in contact with metal, it will not cause short circuits.

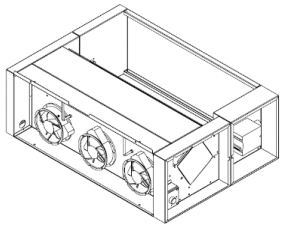
Comparing with the traditional stainless-steel electric heater, the surface temperature of PTC electrical heat is lower which will not burn attaching objective and it won't cause any abnormal smell.

3.2 Various Ventilation Options

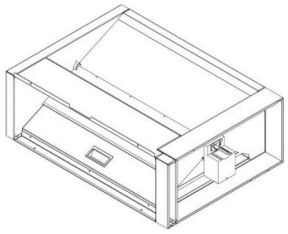
Commercial Room Ventilator (CRV): The power open, spring close, fresh air damper allows outside fresh air to enter the building. Adjustable actuator position allows varying amount of outside air to enter the building.



Energy Recovery Ventilator (ERV): The energy recovery ventilator harvests energy contained in the exhaust air mixing it with fresh air across a stationary cubic heat exchanger. The filter medium is designed to be pulled out easily for cleaning and replacement.



Economizer: The economizer uses outdoor air to provide cooling when the outdoor temperature is both cool and dry. It will greatly save energy from stopping the compressor operation.



Conclusion

As the demand grows for more energy efficient HVAC systems to be deployed in schools, modular buildings and light commercial applications, Inverter driven technology will lead the way in helping site managers achieve much more impactful results. The many cutting-edge features used in the AIRSYS COM4T units are currently being deployed across the US. Our team of trained engineers, facility technicians and sales team members are available to assist you with your next project. Contact us today to join the progressive movement toward becoming a CONVERTER TO INVERTER!

Sales Contact

Email: ASNsales@air-sys.us

Company Main: + 1 (855) 874-5380

An AIRSYS COM4T unit installation at a school located in Goleta, CA

AIRSYS

BALANCE THE ENVIRONMENT.

North America

AIRSYS (NORTH AMERICA) SALES AND SERVICE CONTACT:

Sales Contact

Email: ASNsales@air-sys.us

Company Main: + 1 (855) 874-5380

Service Contact

Email: ASNsupport@air-sys.us

Company Main: + 1 (855) 874-5380

AIRSYS GLOBAL SUBSIDIARIES CONTACT:

AIRSYS REFRIGERATION ENGINEERING TECHNOLOGY (BEIJING) CO., LTD.
Add: 10th floor, Hongkun Shengtong building, 19, Ping Guo Yuan Xi Xiao Jie,
Shijingshan, Beijing, China 100043
Tel: +86(0)10 68656161

GU'AN AIRSYS ENVIRONMENT TECHNOLOGY COMPANY LTD.
Add: 25, Dongfang Street, Gu'an Industry Park, Langfang City, Hebei Province, China
Tel: +86(0)10 68656161

SHANGHAI AIRSERVE HVAC SYSTEM SERVICE CO., LTD.
Add: #7-2, No.658, Daduhe Rd., Putuo District, Shanghai, China, 200333
Tel: +86(0)21 62452626 Fax: +86 (0)21 62459622

AIRSYS AUSTRALIA SALES OFFICE
Add: PO BOX 1088, Flagstaff Hill, SA, 5159, Australia
Tel: +61 479151080

AIRSYS BRASIL LTDA.
Add: Av. Moaci, 395 Conj 35/36 04083-000 – Planalto Paulista SAO PAULO – SP
Tel: +55 (11) 25976817 / +55 (11) 21585560

AIRSYS DEUTSCHLAND GMBH
Add: Dahlweg 120, D-48153 Münster Germany
Tel: +49 (0) 1757535054 / 251-97307478

AIRSYS TURKEY - KLIMA SANAYI VE TICARET A.Ş.
Add: Barbaros Mah. Evren Cad. Erzurumlular Sk. No:23 Ataşehir / Istanbul Turkey
Tel: +90(216) 4706280 Fax: +90(216) 4706290

AIRSYS (NORTH AMERICA), LLC
ICT and Human Comfort Cooling:
Add: 7820 Reidville Rd.
Greer, SC 29651 , USA
Tel: +1 (855) 874 5380
Web: https://airsysnorthamerica.com/

MEDICAL COOLING:
Add: 3127 Independence Dr Livermore, CA 94551, USA
Tel: +1 800 7131543
Web: https://advancedcoolingtech.com/

AIRSYS SINGAPORE PTE. LTD
Add: 50, Tagore Lane Entrepreneur Centre, #03-04 (F), Singapore 787494
Tel: +65 64991850
Fax: +65 68416301

AIRSYS (UK) LTD.
Add: 245 Europa Boulevard, Warrington, UK. WA5 7TN
Tel: +44 (0) 1925 377 272
Call Centre: +44(0)8456099950

www.air-sys.com

AIRSYS-P-WP-COM4T-INV.E2003V01.1ASC

WWW.AIRSYSNORTHAMERICA.COM