Coal-fired central heating is traditionally one of the most common methods for indoor heating. It is also generally associated with adverse impacts to health and to the environment. To address this, Europe has widely adapted air source heat pump technology as a cleaner and more sustainable method for comfort heating. And now more countries around Asia are starting to design air source heat pump applications to deliver outstanding comfort and low operating cost.

**Challenges and opportunities**

**Air source heat pump technology**

*Highly efficient, environmental friendly, comfortable, and precise control*

Requiring only a relatively small amount of energy to drive the compressor, air source heat pump technology delivers hot water to floor heating, radiators and sanitary water applications. Comfort temperatures during harsh winters are easily and efficiently reached, contributing to significant energy savings.

**The advantages of variable speed technology**

- Higher part load efficiency
- Better low temperature heating capacity
- Wide voltage operation
- R410A Compatible eco-friendly refrigerant
### System manufacturers' challenges

| Need to coordinate with various compressor and electronics suppliers for system development | **One-stop shop**
| Capability to supply all core components in variable speed systems including compressors, drives, controllers, temperature sensors, valves etc. |

| Lack of adequate technical support | **Dedicated integrated solution team**
| Providing customers with 24/7 end to end technical support |

| Long development cycle and uncertain reliability | **Smart control, reliable performance**
| High Emerson design standards verify all solutions. Control logic, system protection, parameter optimization, full integration |

| Substantial reduction of low-temperature heating capacity | **ZWW series ultra-low temperature solution**
| The newly developed ZWW series variable speed compressors are equipped with EVD series drives to solve the problem of low-temperature heating shortage |

| Cost-effective solution for low temperature heating | **VPW series low temperature solution**
| Economical, energy-saving and worry-free maintenance with a robust and well recognized VPW series variable speed compressors |

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**Compressor, Drive, Controller, Electronic Expansion Valve, Temperature Sensor**
Emerson strives to be the leader in integrated solutions for air conditioning, heating and refrigeration industries

Emerson is fully committed to developing innovative solutions for the HVACR industry and to help customers reach their human comfort goals. Emerson responds quickly to the market changes and listens attentively to the voice of customers. With Emerson, you can consider your heating challenges solved.

Our service offerings:

- Provides customers with full technical support services
- Coordinates with internal resources and Emerson laboratories to fully validate solutions
- Delivers safe and reliable product solutions for the market
- Continues to expand system simulations and system lab capabilities

Value for customers

- Market-leading system performance
- Trusted Emerson brand with decades of heating solutions experience
- Helping customers respond quickly to market demands
- Higher unit reliability
- On-site monitoring continuously tracks real-time performance
Emerson provides its customers with a skilled technical team and expert lab support. These benefits put the customer at the cutting edge of technology and design.
During air-source heat pump system development, Emerson conducted an in-depth study on the possible issues affecting its customers and designed a full suite of solutions to address the market and its pain points. Emerson integrated solutions for heat pumps can solve the harshest heating challenges with flexible and various combinations.
Configuration options of the heat pump systems

- Solution A – adapts to the ultra-low temperature environments (up to -30°C), with core components of the Emerson brand, designed for the applications in extreme cold regions.
- Solution B – adapts to the low temperature environments (up to -25°C), with core components of the Emerson brand, designed for the application in cold regions.

Example: China Climate

Severe cold regions
Minimum temperature < -30°C
Beijing mountain area
Three Northeast Provinces (Liaoning, Jilin, Heilongjiang)

Cold regions, hot summer and cold winter
Minimum temperature < -25°C
North and Northwest China
(Shanxi, Tianjin, Shandong, Shaanxi, Gansu, etc.)
In the case of equivalent heating, the EVI is turned on. The ZWW050 has a noise advantage of 2-4 dBA under the operating conditions of the H company’s EVI, which can avoid the noise reduction measures of the compressor, help to reduce the noise of the air source heat pump and improve user satisfaction.

The comparison test was carried out on a 12 kW low-temperature air source heat pump system. The ZWW050 can achieve a non-attenuation of heat at an ambient temperature of -20°C and a water temperature of 55°C, while the EVI decays by nearly 30%.

The ZWW050SP EVI ON 30-80Hz ZWW050SP EVI OFF 40-80Hz

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Drive

Technical features

• Drive firmware specifically designed for HVAC applications
• Optimum combination of compressor and drive delivers maximum efficiency
• Best in built-in-class protection / Control features for reliable operation
• Sine wave vector control

Current specifications

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<th>Drive model</th>
<th>Input current</th>
<th>Output current</th>
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*The maximum current is based on the ambient temperature of the driving plate at 60˚C and the outlet wind speed of the cooling fins at 3m/s.

System controller

Technical features

• Protection of compressor envelope
• Compressor running speed control
• Integrated expansion valve control
• Superheat control
• Defrosting control
• Control of vapor injection circle
• Compressor oil return management

System controller (outdoor unit)

- Electronic expansion valve
- Pressure sensor
- Temperature sensor
- Four-way valve
- Condenser fan
- Choke
- Filter board
- RS485
- Temperature sensor (EVI loop)
- System controller (indoor unit)
- Wire controller
- Drive
- Compressor

System controller (indoor unit)
Low temperature solution for cold regions

Advantages of VPW series variable speed compressor

• Excellent performance and low noise design
• Concentrated winding motor for higher efficiency
• Wide speed range of 900-7200 rpm for more flexible system designs
• Variable volume ratio scroll significantly improves energy efficiency at low pressure ratio conditions
• Better debris & liquid handling capability

(EVI) Technical features

• Patented EVI design structure
• Capable to expand operating envelope to enable low ambient heating
• Injection solutions to control discharge line temperature with R32 refrigerant
• EVI technology can help to replace system auxiliary electric heating

System performance of VPW series variable speed compressor

Stronger heating capacity at low temperatures

Higher heating efficiency at low temperatures

IPLV comparison test on 14 kW low-temperature air source heat pump system with below zero ambient temperature, vortex air enrichment technology can effectively increase the system heating capacity. Above zero ambient temperature, vortex air enrichment technology can still increase system capacity, but rotor compressors have reduced energy efficiency.
Industry associations and experts highly valued the use of Emerson jet enhancement and frequency conversion technology systems. At the same time, the Emerson frequency conversion low-temperature air source heat pump solution is widely accepted by customers.
## Key integrated solution kit number and combination

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