

COPELAND SCROLL™ COMPRESSORS

China's largest air source heat pump district heating project adopted Copeland Scroll™ Compressors

This project utilized the most compressors with the industry's largest scales in China and it is widely recognized for its success within the industry.

Background

In recent years, China has been promoting environmental protection initiatives, and modernizing district heating is one of its main priorities. In 2019, the Zhao County government in Hebei Province, China, planned to upgrade the district heating in urban areas, replacing traditional heating methods with air source heat pumps, a cleaner alternative method for comfort heating. Covering an area of about 4.3 million square meters, this project exclusively adopted 1,200 Guangdong New Energy Technology Development Co. (New Energy)'s GKD air source heat pumps, each of which is equipped with four Copeland Copeland Scroll™ ZW286 compressors. The system was officially put into use before the 2019 winter and by January 2020, it had been tested by six parties that included project investors, operators, and installers, surpassing all standards.

Challenge

As a public service project, it has faced critical challenges from the beginning, so the government

looked to find a better solution to solve its problems. Some of which included:

- **Technical requirements:** located in central China, the Zhao County winters are long with an average temperature of below zero degrees Celsius and in extreme cases even reaching -25°C . Therefore, the project required that the heating pump could withstand the cold (at least -20°C), so it could operate steadily and stably during the winter months.
- **Installation requirements:** as most of the communities in Zhao County are peaceful and unassuming, the government needed to take power coordination, noise control and heating flexibility into consideration, with the hope it wouldn't cause any inconvenience to citizens while launching the renovation project.
- **Cost control:** the project operated under a BOT (Build—Operate—Transfer) model, which has certain requirements regarding its return on investment, so it was necessary to control costs and improve economic efficiency.

- **Project scale:** since this was China’s biggest district heating project, it needed a significant amount of heat pumps, therefore it was necessary to match the project with a provider who was able to provide sufficient units in a short period of time in order to support the project.



Solution

To meet the project’s needs, Copeland applied the Copeland Scroll™ ZW286 compressor to New Energy’s GKD heat pumps, supporting the completion of the clean energy heating renovation project in Zhao County. After application and testing, the Copeland Scroll compressor with EVI (Enhanced Vapor Injection) scroll heating technology shows it can safely and stably enhance the heat pump’s heating effect at low temperatures. Compared to other conventional heaters, the overall energy efficiency is increased by 10%-20%, significantly reducing energy consumption. On May 1, 2020, GB37480-2019 Minimum allowable values of energy efficiency, and energy efficiency grades for low ambient temperature air source heat pumps (water chiller) packages were implemented. According to the standards, Copeland’s EVI scroll heating technology improved the operation’s energy efficiency and COP (coefficient of performance) by up to 20% at low ambient temperatures, which helps to regulate energy efficiency. For this project, Copeland provided a total of 4,800 compressors, ensuring the operation runs smoothly. This project utilized the most compressors with the industry’s largest scales in China and it is widely recognized for its success within the industry. So far, the units continue to run effectively and have passed six different parties’ strict requirements and standards.



Minimum allowable values of energy efficiency and energy efficiency grades for low ambient temperature air source heat pumps (water chiller) packages

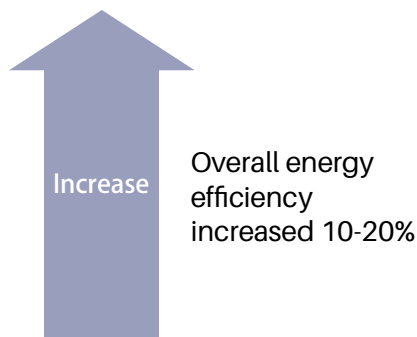
Nominal Heating Capacity (Or Nominal Cooling Capacity) kW	Rated Water Outlet Temperature	Energy Efficiency Standard			
		1	2	3	Coefficient of Heating Performance (COP _h ,W/W)
H≤35 (Or CC≤50)	35°C _a	3.40	3.20	3.00	2.40
	41°C _b	3.20	2.80	2.60	2.10
	55°C _c	2.30	1.90	1.70	1.60
H>35 (Or CC>50)	35°C	3.40	3.20	3.00	2.40
	41°C	3.00	2.80	2.60	2.30
	55°C	2.10	1.90	1.70	1.60

- It is mainly suitable for the end application of Low-temperature Radiation Heating, such as Radiant Floor Heating.
- It is mainly applicable to the end application of Forced Convection Heating, such as Fan Coil, Forced Convection Low-temperature Radiator.
- It is mainly suitable for the end application of the combination of Natural Convection and Radiation, such as Fan Coil, Low-temperature Radiator.

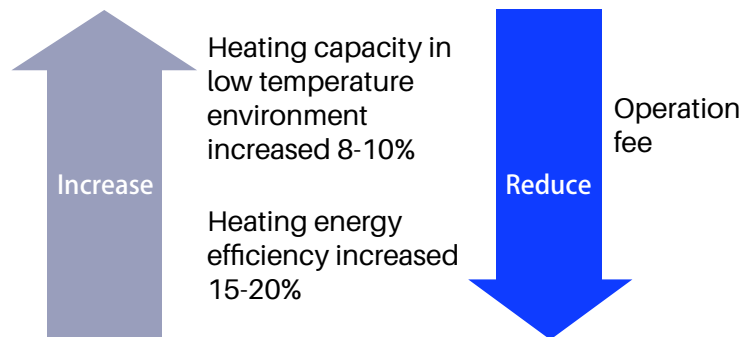
Result/benefit

- **Reliability:** serving as the heat pump system's core, Copeland Scroll™ ZW compressor maintains stable and reliable operations with reduced failures. The six parties, which includes the project investor, operator and installer, tested 20 units of operating equipment about their average heating capacity and average COP to ensure they reached standards.
- **Stable system and wide operating range:** through EVI scroll heating technology, the air source heat pump exhibits a strong heating capacity. The operating evaporating temperature is -35°C, while the condensing temperature is 50°C, which means it can produce 45°C of hot water with the ambient temperature of -30°C. It can help heat pumps deal with cold weather in northern China and ensure they remain stable.
- **Excellent performance and economic benefits:** Using Copeland Scroll ZW286 compressor, the heat pump's heating capacity can reach $\geq 130\text{kW}$, increasing overall energy efficiency by 10% -20% compared to heat pumps with screw compressors. Also, compared to liquid injection technology, EVI technology's capacity is increased by 8-10%, while the energy efficiency is increased by 15-20%. Meanwhile, the investment and operating cost are relatively low, while the investment return period is short, which is beneficial for both investors and individual end users.

Scroll Units VS Screw Units



EVI Technology VS Liquid Injection Technology



- **Shorter and quiet construction period:** the heating system was easy and convenient to install. This project installed heat pumps across 46 different energy stations in a span of two months. Meanwhile, the project was quiet during completion & operation, reducing the negative impact on the community.
- **Replicable success model:** as the industry's largest district heating project with the air source heat pump, its construction and operation will provide valuable experience for future ultra-large heating projects. Using air sources to replace traditional energy sources not only meets the heating needs of residents, but also helps to contribute to today's environmental standards.

Contact us

Asia Pacific

Tel: (852)28663108

Fax: (852)25206227

Shanghai

Tel: (86-21)33387333

Fax: (86-21)33387330

Beijing

Tel: (86-10)85726666

Guangzhou

Tel: (86-20)85955188

Qingdao

Tel: (86-532)81637268

Fax: (86-532)81637267

Taiwan

Tel: (8862)81617688

Fax: (8862)81617614

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