

Case | Harbin, China

China's ice city finds a better way to keep warm, bidding small coal-fired boilers farewell

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Possibility in every drop



While the rest of China enjoys a cooling autumnal season in mid-to-late October, the city of Harbin, dubbed the “Ice City of China”, sees its lowest temperature drop to sub-zero. Located in the northernmost province Heilongjiang, Harbin is the political, economic, and cultural epicentre of Northeastern China, with a population of 10.8 million. Its bitterly cold winters meant that the heating season in Harbin lasts for over six months, and that heating is one of the most important elements when it comes to the locals’ well-being and quality of life.

There are a total of 10 heating sub-districts in Harbin. Jinshanpu Heating Company manages an area of 28 million m², which serves over 270,000 end users comprising of residential buildings, schools, and businesses.

Realities on the ground, and the challenges in local heating

Currently, there are two types of heating utilised in China – distributed heating, and centralised heating. The difference between them lies in the heat source used and scale. Distributed heating relies on small coal-fired boilers to supply heat to one or multiple buildings, and is characterised by its short transmission

distance and being on a smaller scale. Centralised heating, in contrast, supplies heat to end users in a larger area, spanning even a city, generating heat from one or multiple sources and transmitting heat through networks and heat exchange stations.

Located in the outskirts of the Daoli district in Harbin, the town of Xinfu used small coal-fired boilers to supply heat in the area. This approach is highly energy inefficient, requiring large amounts of coal constantly. As a result, heating fluctuates throughout the day, with temperature especially low after midnight and in the early morning.

In addition, such small coal-fired boilers lacked proper desulfurisation and denitrification devices. This meant that its emissions are discharged into the air directly, contributing to air pollution. According to one resident, “The small coal-fired boilers give off a lot of smoke that can be suffocating, and the heating generated was very unreliable.”

In 2017, 10 ministries in China jointly released Plans for Clean Heating in Northern China in Winter (2017-2021), which sets phased goals to achieve clean heating in Northern China. The plan also requested an expansion of centralised heating areas to replace small coal-fired boilers, which are unable to meet relevant environmental standards. In 2019, a centralised heating renovation project was carried out in Xinfu. With newly built heating networks and 18 heat exchange stations, the town bids farewell to small coal-fired boilers, and is now managed by Jinshanpu Heating Company.



Smart, energy efficient heating solutions

The centralised heating project in Xinfu covers an area of 1 million m², consisting of schools, kindergartens, shopping malls, high-rise buildings, as well as multi- and single-storey buildings with around 42,000 end users.

Grundfos' products and solutions are widely used at the heat source, heat relay stations and heat exchange stations, including 23 prefabricated smart heat exchanger systems at 18 heat

exchange stations, making it the largest application of its kind that is put into operation by Grundfos.

Wang Feng, Manager of the Shengli Relay Station of the 5th Operation Department at the Jinshanpu Heating Company, said, “The system is very smart. It intuitively adjusts the parameters of the charging and circulating pumps based on external circumstances, such as outdoor temperature. As a result, we do not need to be onsite 24 hours, making it a truly unattended station.”



Besides real-time monitoring and reporting of the parameters including the flow, head, power and energy consumption of the pumps, the system is outfitted with multiple control strategies and performance indicators such as pump performance curves. This ensures that the pumps are constantly operating at an optimal state as it intuitively adapts to its surroundings. By equipping the pumps with a “smart brain”, the smart heat exchanger system has significantly improved the entire system’s energy efficiency, while reducing energy consumption and increasing operational efficiency.

The Heilongjiang Province has been actively promoting the concept of smart city in recent years, with smart heating being one of its key elements. Smart heating is also the inevitable trend in a city’s green development. Qi Shuang, Director of the Control Centre at Jinshanpu Heating Company, said, “Heating companies are undergoing a transformation – we need to provide quality heating experience to each and every resident and end user properly and efficiently, all while maximising the limited resources we have at hand. Being environmental-friendly and energy efficient is vital for us.”

Clean heating to ensure better quality of life for all

Thanks to the electromechanical integration technology Grundfos uses in its prefabricated smart heat exchanger system, it took only 45 days to complete the process – from placing the orders, installation, and running a trial on all 23 systems. Putting into operation in October 2019, the systems have ensured smooth and efficient operation of all heat exchange stations in Xinfu throughout the heating season, providing reliable heating for all end users, and was in turn widely recognised. Air quality in the area has also improved now with the centralised heating solution.

A local resident said, “Now we can enjoy heating 24/7, which is very good for families with seniors and young children. It is beneficial to the environment too.” Sharing the same experience, another resident said, “Both the air quality and heating experience have improved, and we are very happy about it.”

According to data provided by Jinshanpu Heating Company, the average indoor temperature in Xinfu has reached 23°C during the 2019-2020 heating season, with a thermal load of 0.37GJ per square metre. Jinshanpu Heating Company has been rated as one of the six outstanding heat suppliers by the Housing and Urban-Rural Development Bureau of Harbin. The centralised heating project in Xinfu has been highly regarded in Harbin, and even in the wider Heilongjiang Province.

Notably, Grundfos’ prefabricated smart heat exchanger system has outstanding performance in terms of energy savings and emission reduction. In a 183-day period, heat and water consumption have dropped by 38% and 71% year-on-year, respectively. Power consumption has decreased by more than half.

Qi Shuang said, “Over 90% of the Grundfos pumps we are using have been working within their performance curves and in line with our selection criteria at the planning stage, ensuring that our systems operate economically and safely.”

For Northern China, heating and the environment are both vital to overall quality of life. By improving existing heating capabilities while still reducing energy consumption and emission, the smart heating solution goes a long way towards clean heating in China.

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