CASE STUDY

Copeland variable speed integrated solutions application case heating field test in beijing miyun

Background

In 2018, Tsinghua Tongfang won the bid of "Coal to Electricity" project for more than 800 households in Mujiayu town, Miyun district, Beijing. The project adopted Tsinghua Tongfang split variable speed low ambient temperature air source heat pump unit HSYR-DG-18(D)BPIII which equipped with Copeland ZWW050 variable speed integrated solutions. The heat pump units were put into use in November 2018. China Academy of Building Research conducted actual monitoring in Shayugou village during the heating season from November 2018 to March 2019.

Challenge

- Biding technical requirements: according to GB/T25127.2, the heat pump units should meet requirements of COP >2.2 and IPLV(H)>2.6 under nominal conditions; when the temperature is -20°C, without electric auxiliary heating, the COP should be no less than 1.8; when the ambient temperature is -25°C, the water heating temperature can reach more than 50°C; When ambient temperature is -30°C, the heat pump should normal start without electricity auxiliary heat
- Climate characteristics: the user is located near the mountains, the lowest temperature reached -23°C in the past five years. heat pump system in extreme weather should provide strong power to safeguard the warm and comfort
- Users expectation: heat pump system is reliable and energy conservation, long-term operation is guaranteed, can reduce operating costs throughout the heating season

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Project overview

User address:
Shayinggou Village, Mujiatun Town,
Miyun District, Beijing

Heat pump unit:
Tsinghua Tongfang HSYR-DG-18(D)BPIII

Outdoor temperature:
The average is -2.0°C,
The lowest average is -13.3°C.
The minimum hour by hour value is -19.9°C

Nominal heating conditions:
Ambient Temp -12°C, the water temperature 41°C:
Heat Capacity : 14.4 kW
COP: 2.34
IPLV (H): 2.82

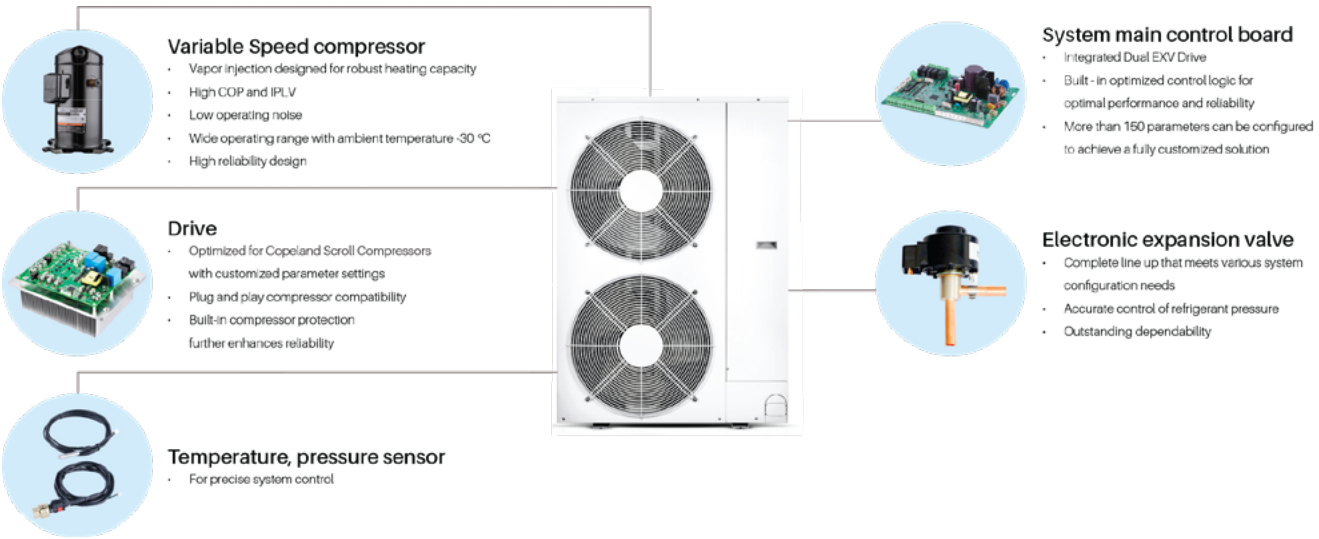
Terminals:
Floor heating

Heating area:
160m^2

Average household:
3 persons

Copeland ultra low temperature variable speed integrated solutions – reliable and efficient, help cold regions to win the battle of blue sky

- A more optimized solution
- Save project cycle time and cost
- Full technical service
- Improve energy efficiency and reliability
- One-stop purchasing
- Strong technical team and system lab support



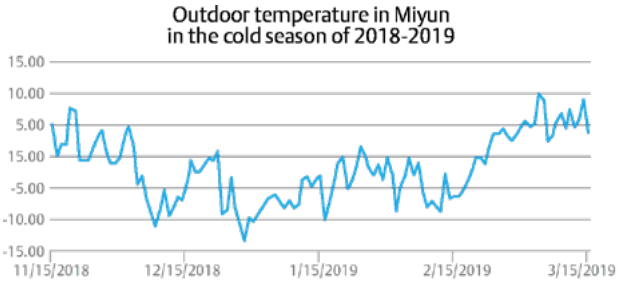
System monitoring result

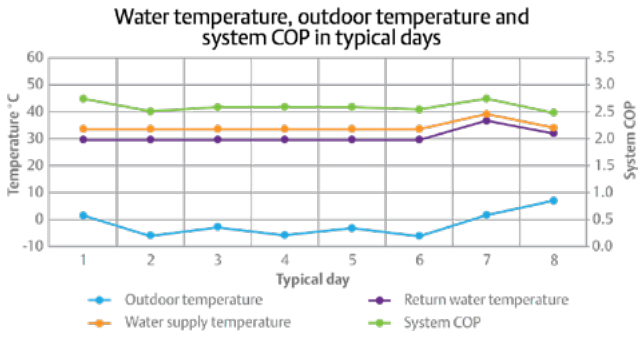
Monitoring institution:
China Academy of Building Research

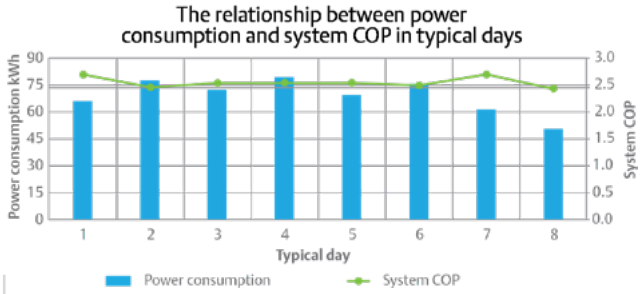
Monitoring duration:
2018/11/15~2019/3/15, 120 days total

Evaluation method:
According to the outdoor ambient temperature and heating system load rate, a typical day is needed to analyze and comprehensively evaluate the operational effects of a system. A typical day is selected every half month, which totals to 8 typical days during the whole heating season. The average value of each index in these 8 typical days is used for the comprehensive system performance evaluation during the cold season.

Copeland Ultra Low Temperature
Variable Speed Integrated Solutions
Compressor, Drive, Controller,
EXV, Temperature Sensor







During monitoring period:

- The average outdoor temperature is -2.0°C,
- The lowest daily average outdoor temperature is -13.3°C.
- The minimum outdoor temperature is -19.9°C

During the whole cold season:

- The system average water supply temperature is 33.84°C, system COP is 2.86, the average indoor temperature is 21.2°C
- Energy efficiency is among the best in Miyun District monitoring.
- Consistent system performance, users were satisfied with the heating effect
- Per unit area, the average daily power consumption is 0.43kWh/(m2·d), the power consumption in the whole heating season is 51.6kWh/(m2.d)
- Per unit area, the average daily operating cost is 0.12 RMB/(m2·d), the operation cost in the whole heating season is 14.4 RMB/(m2.d)

Note: Valley electric price is 0.1 RMB/kWh, Peak electric price is 0.4883 RMB/kWh, Valley electricity rate is 55.2%

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