Natural Refrigerant CO^2 Air to Water System

Ultra Efficient Technologies from MHI

Mitsubishi Heavy Industries introduce 30kW Heat Pump Water Heater

MHI's NEW "Q-Ton"

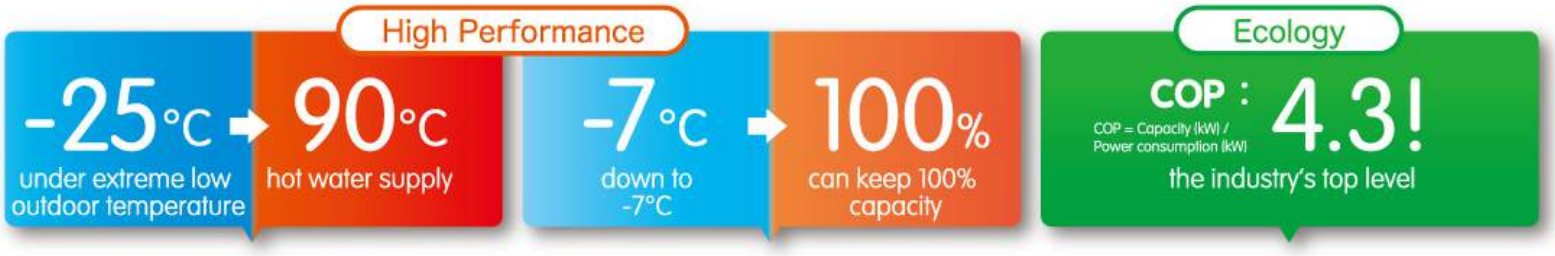
The World's **FIRST** 2-Stage CO^2 Compressor

Provides Hot Water up to 90℃

COP of up to 4.3
[430% efficiency!]

Operation down to -25℃ Ambient

Using **NATURAL REFRIGERANT**



Development concept and Advantage

MITSUBISHI HEAVY INDUSTRIES, LTD.

Performance issue to be solved on conventional air to water heat pump

**When operating under low outdoor temperature,
heating capacity and heating efficiency decrease significantly.**

MHI solution

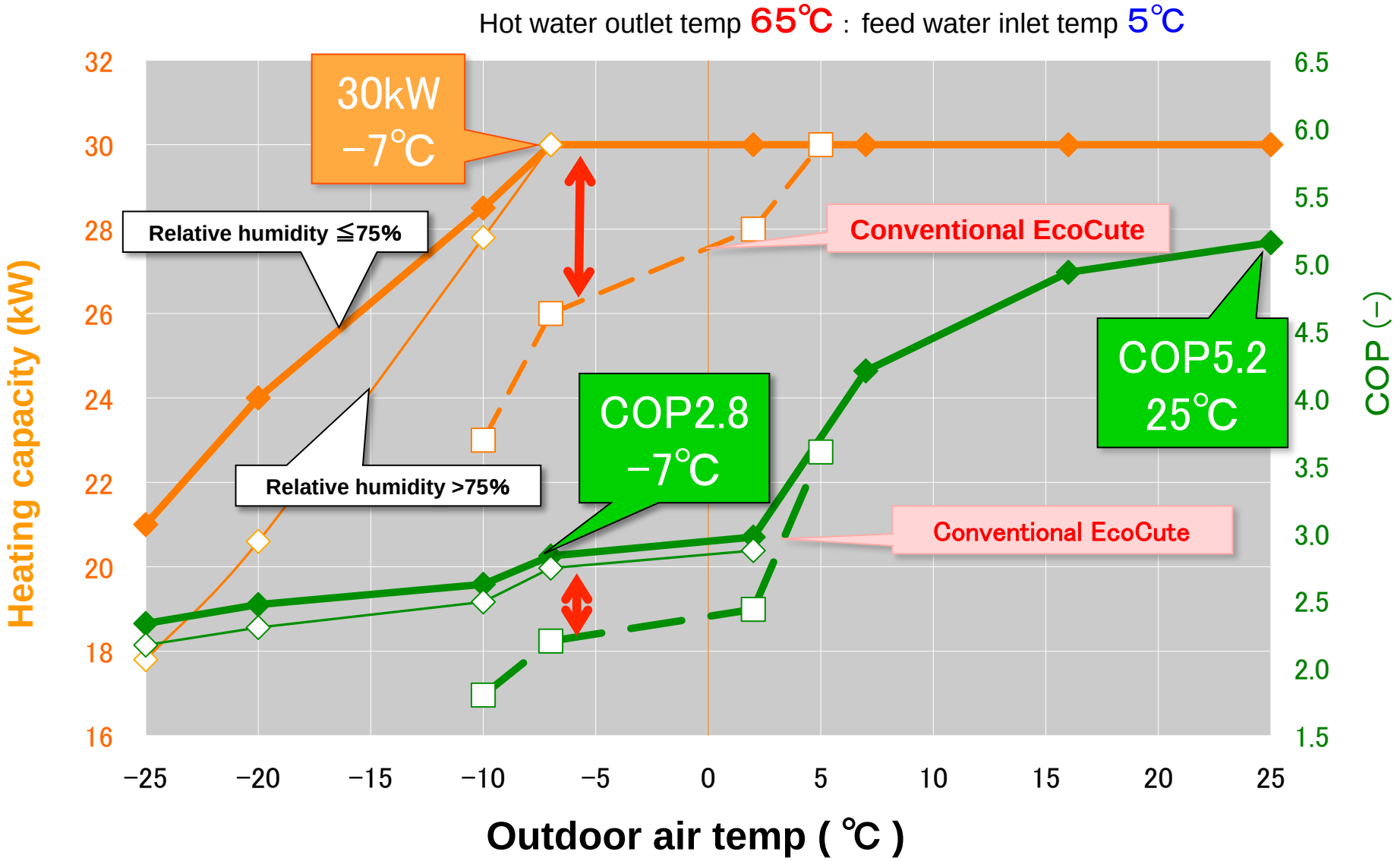
Point 1 The world's first CO^2 two-stage compressor (Scroll + Rotary) is adopted.

Point 2 The rated heating capacity is 30kW and sustainable at ambient air temperature as low as -7℃

Point 3 The COP on rated conditions reaches 4.3, which is the highest level in the industry

Point 4 A 90℃ hot water supply is available even at ambient air temperature as low as -25℃

Heating performance of Q-ton

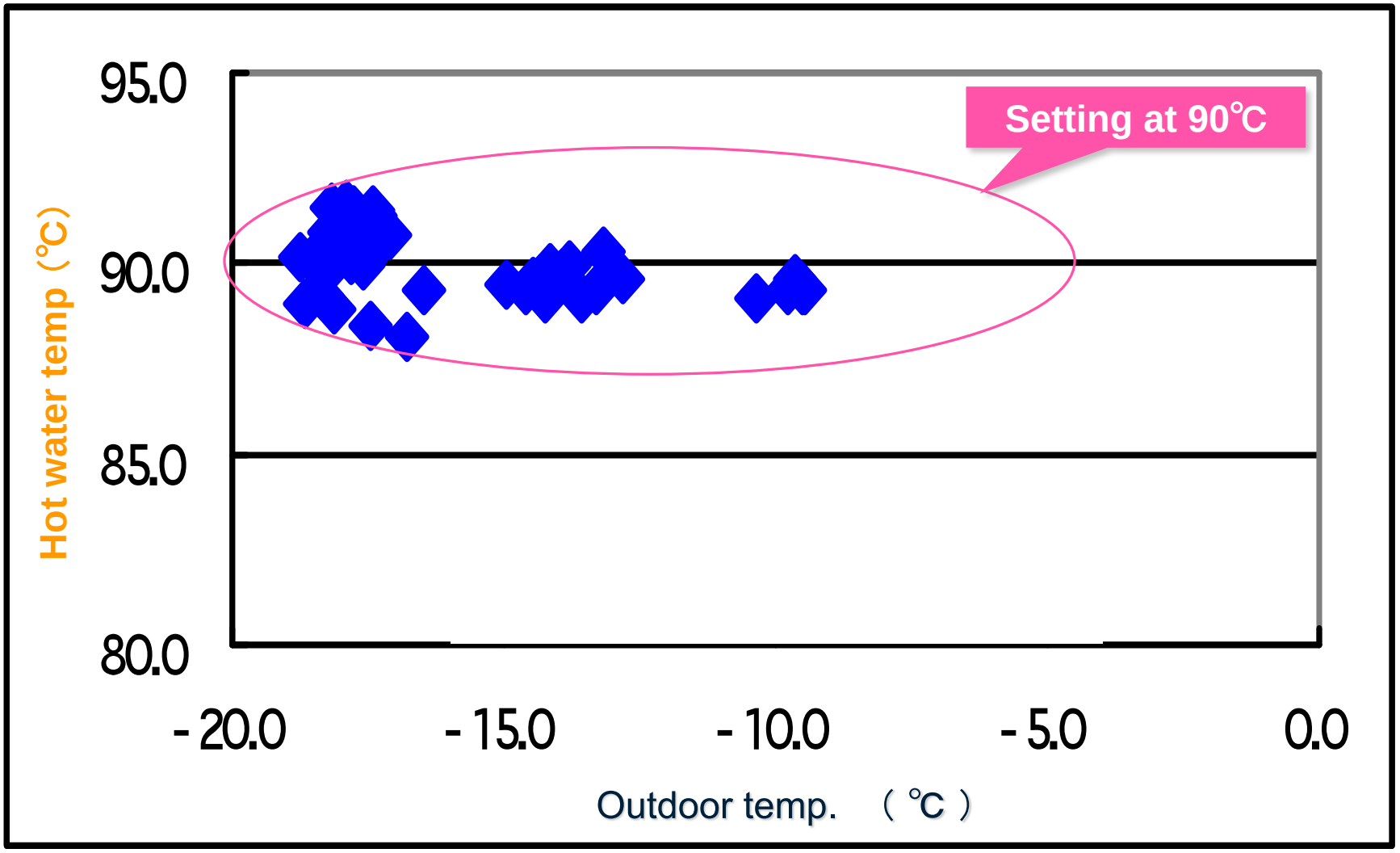


Field Test installation site

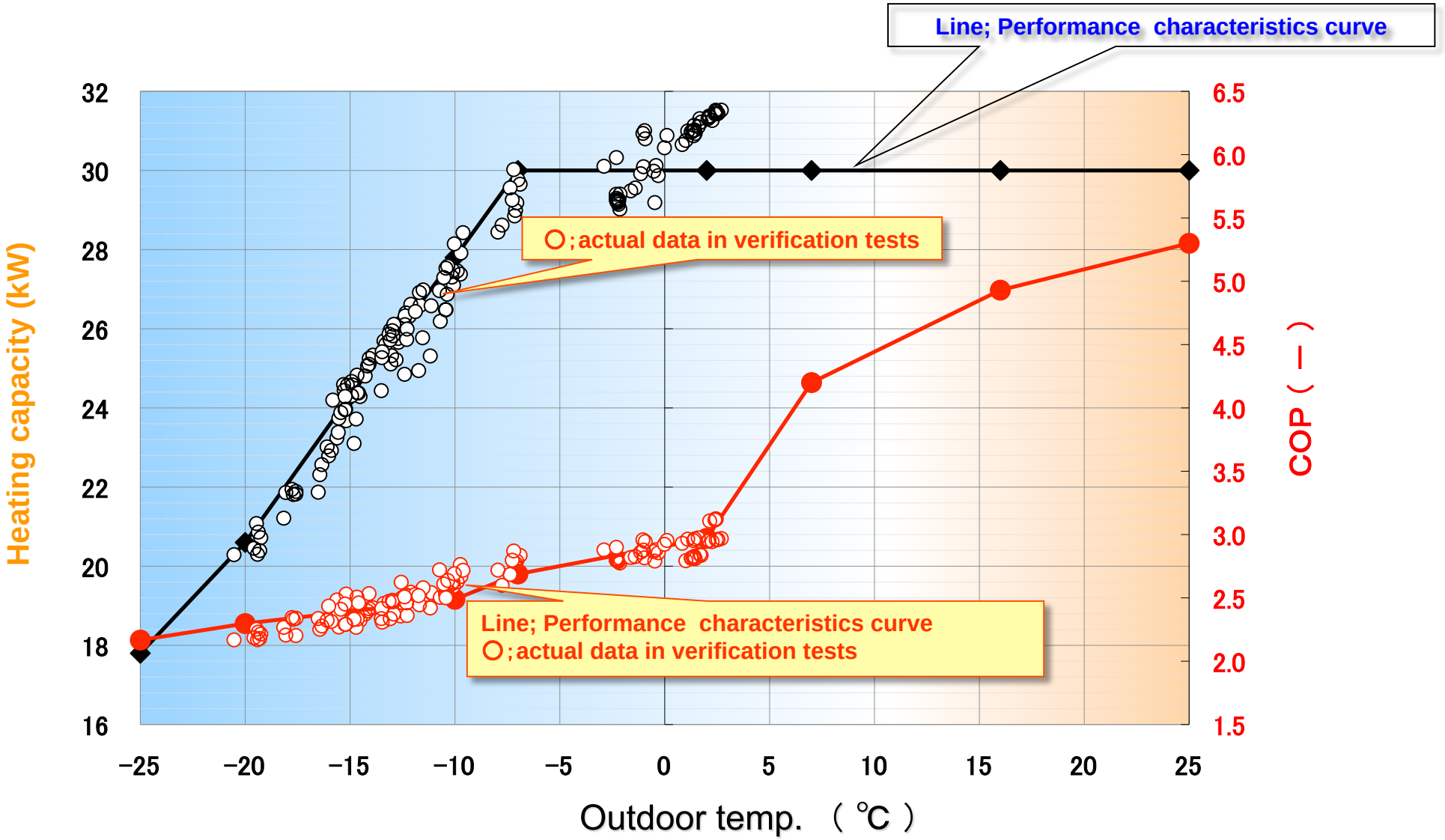
Location : Hachimantai, Iwate pref. / famous for heavy snow

- **System composition**
  Q-ton 1 unit,
  Unvented cylinder 500ℓ x 4units
- **Purpose of use**
  Kitchen and bathroom

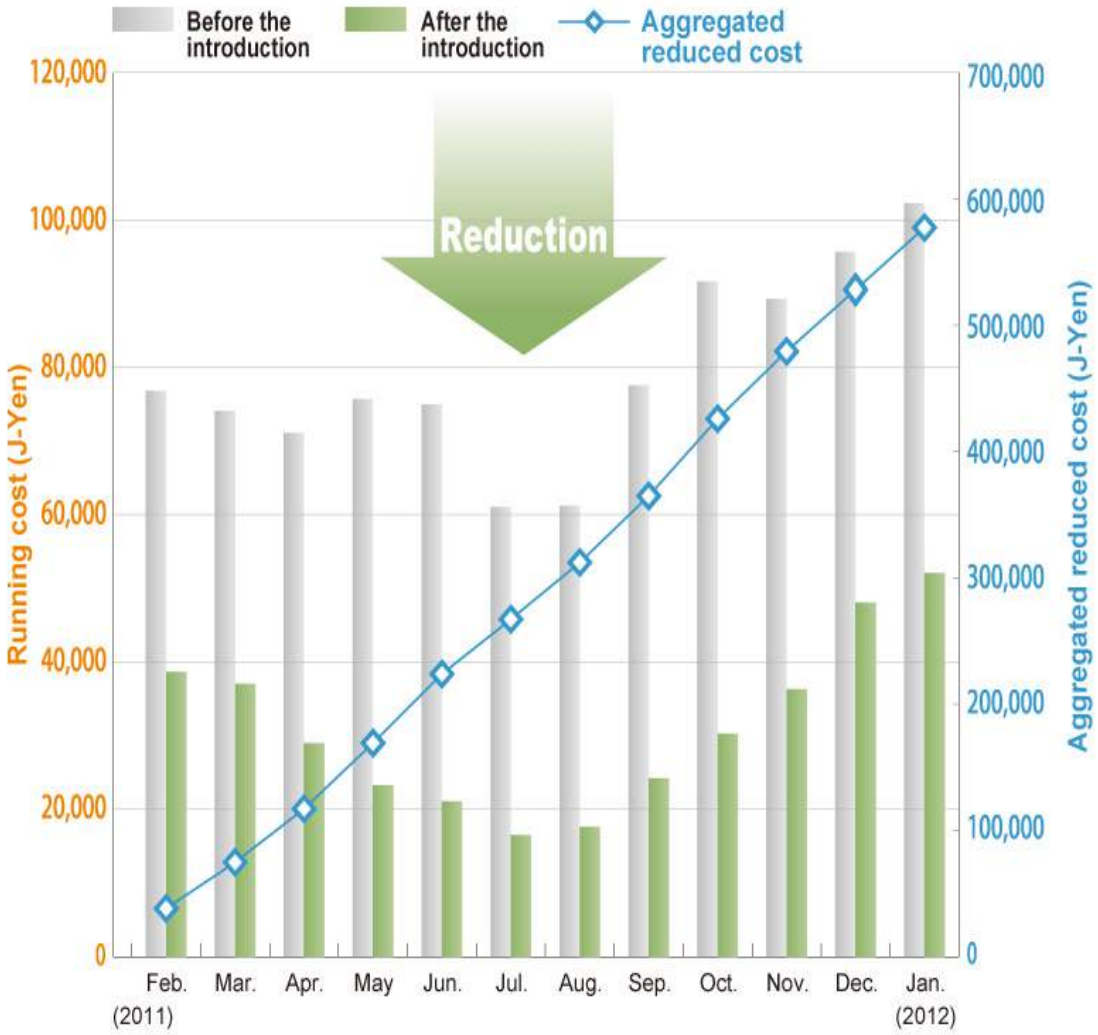
Field Data ; **Actual Supplying 90℃ hot water**



Field Data ; Actual operation point



Cost-saving result : Annual results summary



Running cost

-61%

CO^2 emission amount

-29%

[Calculation conditions]

Price rate

Q-ton/electric rate The summer :\11.65/kWh,
The other season: \10.70/kWh
Boiler/kerosine : ￥90/L

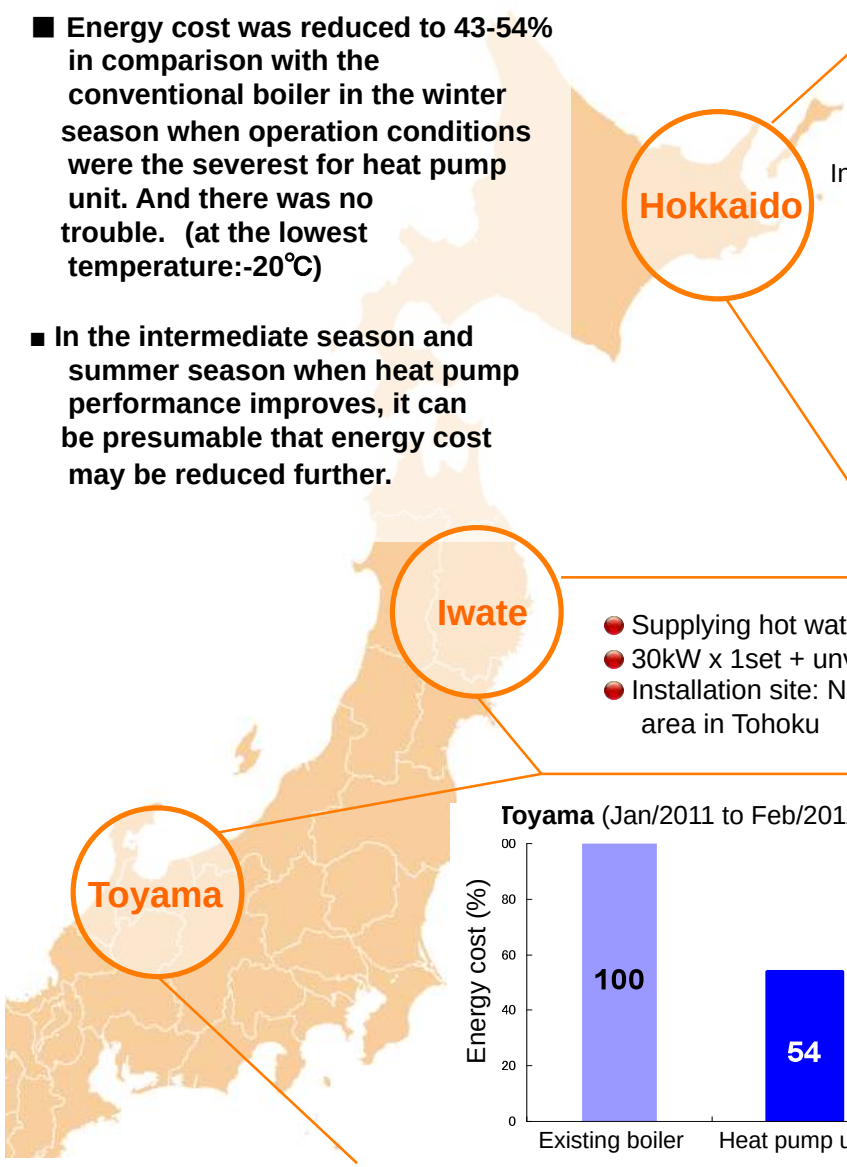
CO^2 emission amount

Q-ton/electric : 0.546kg-CO_2/kWh
Boiler/kerosine : 2.490kg-CO_2/L

Cost-saving result in Winter

■ **Energy cost was reduced to 43-54% in comparison with the conventional boiler in the winter season when operation conditions were the severest for heat pump unit. And there was no trouble. (at the lowest temperature:-20℃)**

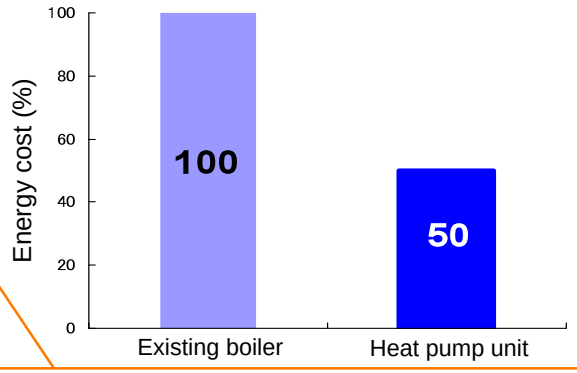
■ **In the intermediate season and summer season when heat pump performance improves, it can be presumable that energy cost may be reduced further.**

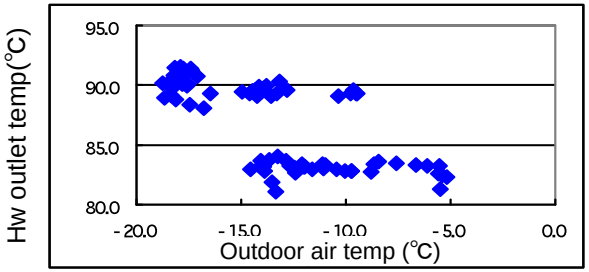


Hokkaido

- Supplying hot water for kitchen and hand-wash
- 30kW x 1set + unvented cylinder
- Installation site: Hokkaido area severely cold area (-20℃or lower)

In **Hokkaido** (Dec/2010 to Jan/2011)

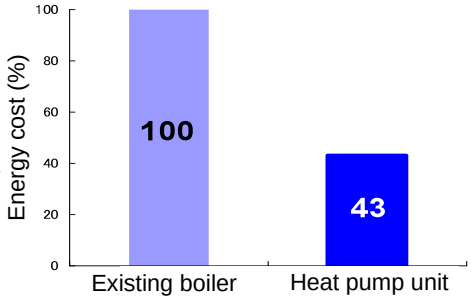




Iwate

- Supplying hot water for kitchen and bath
- 30kW x 1set + unvented cylinder
- Installation site: North Iwate area severely cold area in Tohoku

In **Iwate** (Jan/2011 to Mar/2011)



Toyama

Toyama (Jan/2011 to Feb/2011)

- Preheating feed water to the boiler
- 30kW x 1set + heat exchanger
- Installation site: Toyama area Low temp and high humidity area

Installation Sample in Japan

Spreading through the various fields of Japan













Installation Sample ① (Hybrid system with boiler)

The hybrid system combined with a boiler takes advantage of good sides of 2 system.

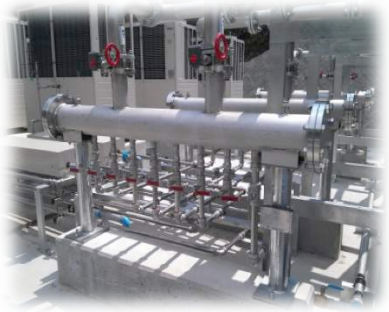
Japanese hot spring inn in Matsumoto and Kanazawa

- **System composition**
  Q-ton 1unit,
  Unvented cylinder
  500ℓ x 2units
- **Purpose of use**
  Bathroom, shower, faucet Utilizing existing tank and boiler.

Installation Sample ② (School lunch center)

This site is the largest all-electric school lunch center in Japan.

- **System composition**
  Q-ton 12 units,
  Large open tank
- **Purpose of use**
  hot water supply for dishwashers



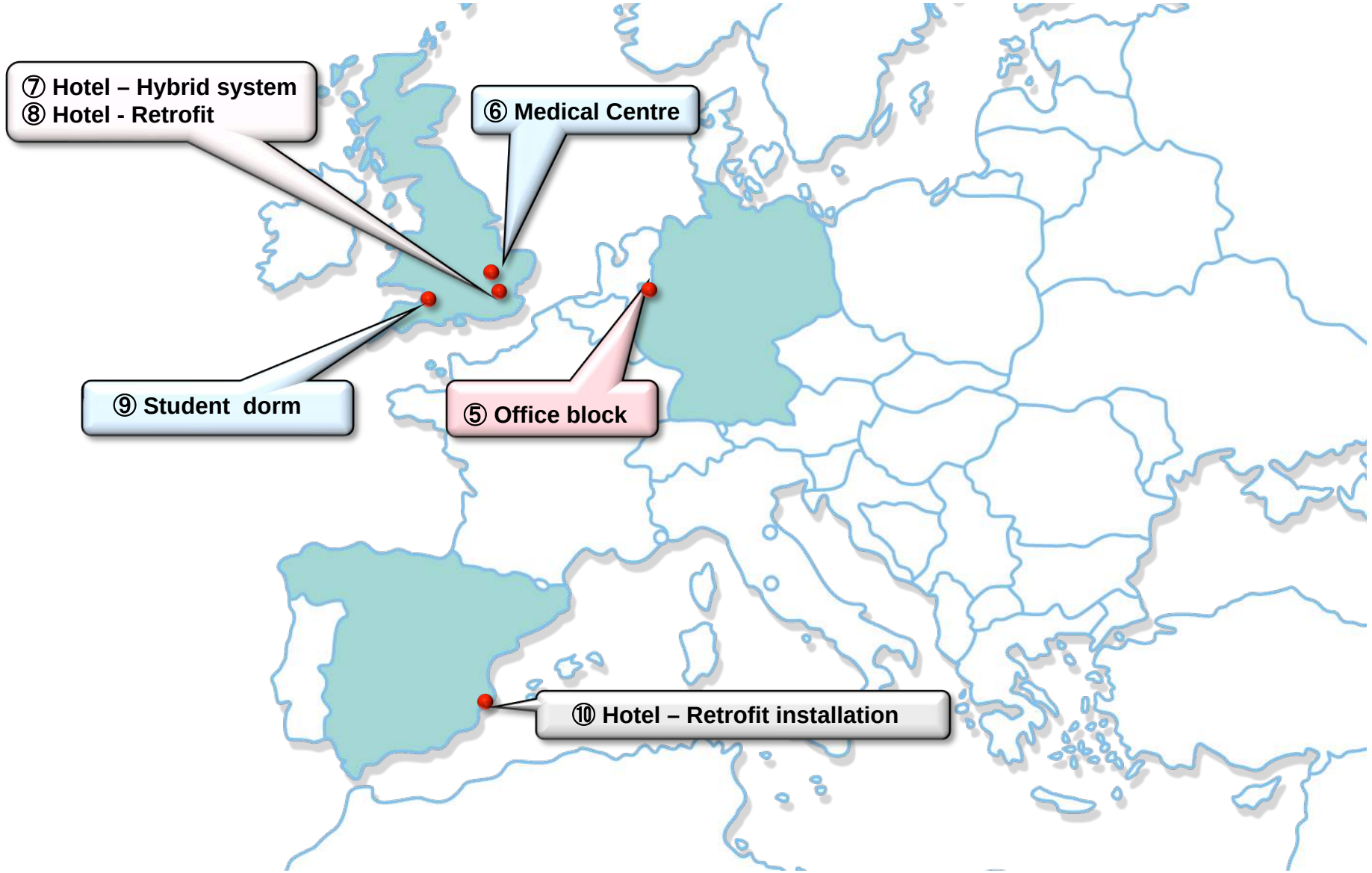
Installation Sample ③ (warm-bathing facility)

- **System composition**
  Q-ton 12 units,
  Large open tank
- **Purpose of use**
  preheating water supply for boiler

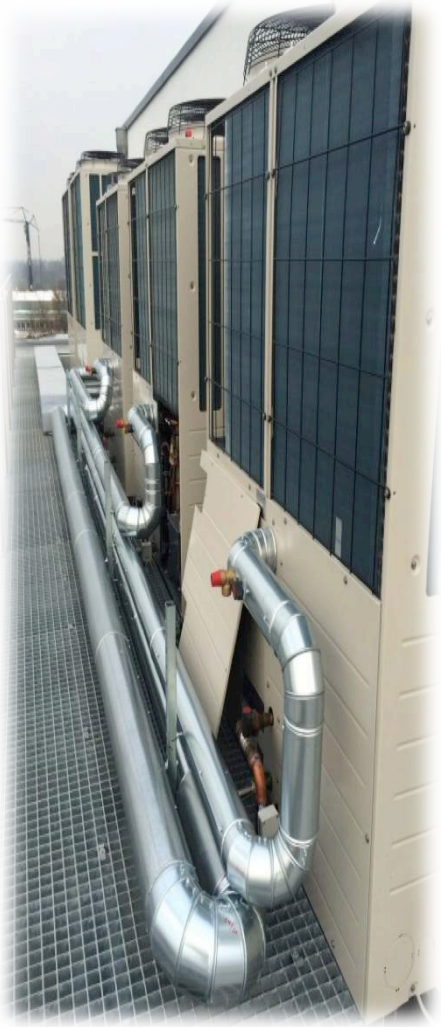
Installation Sample ④ (Food factory)

- **System composition**
  Q-ton 4 units,
  Open tank 4,000L, 15,000L
- **Purpose of use**
  Cleaning in the factory, food manufacturing process use

Installation Sample in Europe



Installation Sample ⑤　(Office block – UFH)



- **System composition**
  Q-ton　3 units,
  Closed tank　1,000L

- **Purpose of use**
  Central heating system via under floor heating circuit

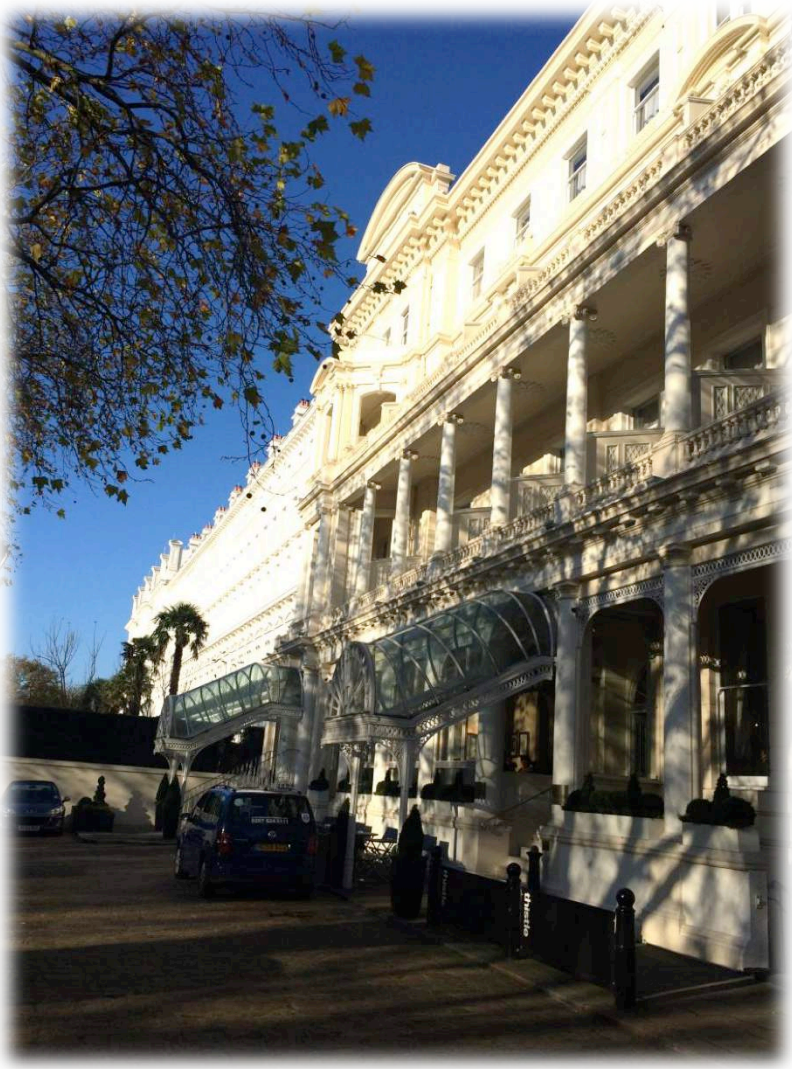
Installation Sample ⑥　(Medical Centre – New build)

- **System composition**
  Q-ton 1 unit,
  Closed tank　1,000L
- **Purpose of use**
  DHW supply to 20 treatment and examination rooms including the reheat of the secondary circuit

Installation Sample ⑦ (Hotel – Hybrid system)

- **System composition**
  Q-ton 1 unit,
  Closed tank 2 X 1,000L

- **Purpose of use**
  DHW supply to 56 rooms using the existing boiler to reheat the distribution circuit



Installation Sample ⑧　(Hotel – Retrofit)

- **System composition**
  Q-ton　　2 units,
  Closed tank　 2 X 1,000L

- **Purpose of use**
  DHW supplies to 250 people using the existing boilers to deliver central heating

Installation Sample ⑨ (Student dorm)

- **System composition**
  Q-ton 1unit,
  Closed tank 1 X 1,000L

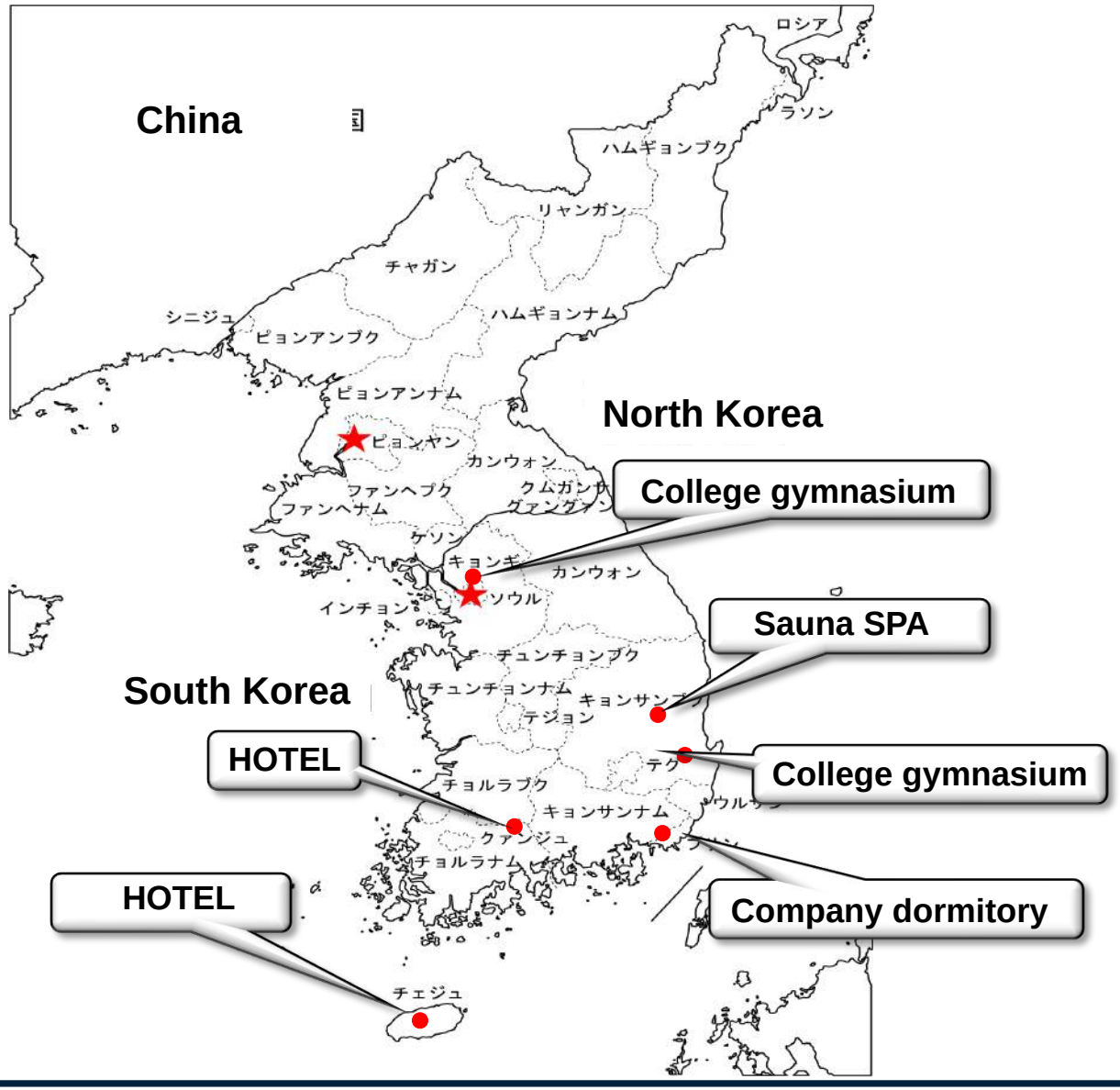
- **Purpose of use**
  DHW supply for up to 48 students using 6 Kw immersion element to cover re-circulation demand

Installation Sample ⑩ (Hotel – Retrofit installation)

- **System composition**
  Q-ton 2unit,
  Closed tank 2 X 3,000L + 5 X 4,000L tank

- **Purpose of use**
  DHW is provided to 200 rooms and the existing boiler is kept for back up

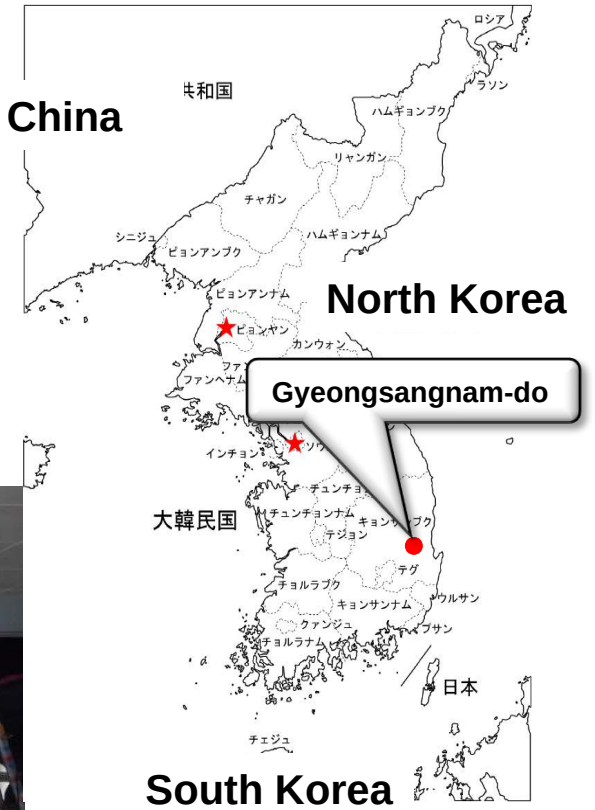
Installation Sample in South Korea



Installation Sample ⑪ （ Sauna SPA ）

- **System composition**
  Q-ton 2units,
  Horizontal closed tank 8,000L
- **Purpose of use**
  Bathroom, shower, faucet Utilizing existing tank and boiler.

During installation



Installation Sample ⑫ （Company dormitory）

- **System composition**
  Q-ton 8units,
  Horizontal closed tank 12,000L x 2
- **Purpose of use**
  Bathroom, shower, faucet Utilizing existing tank and boiler.

SUMMARY

The rated heating capacity of 30kW is sustainable at ambient air temperature as low as -7℃

In the field-test, the Q-ton operational cost was really lowered by almost half.

Q-ton came to be used in the various fields

Thank you for your kind attention

MITSUBISHI HEAVY INDUSTRIES, LTD.
Our Technologies, Your Tomorrow