

Gas heat pumps : product overview

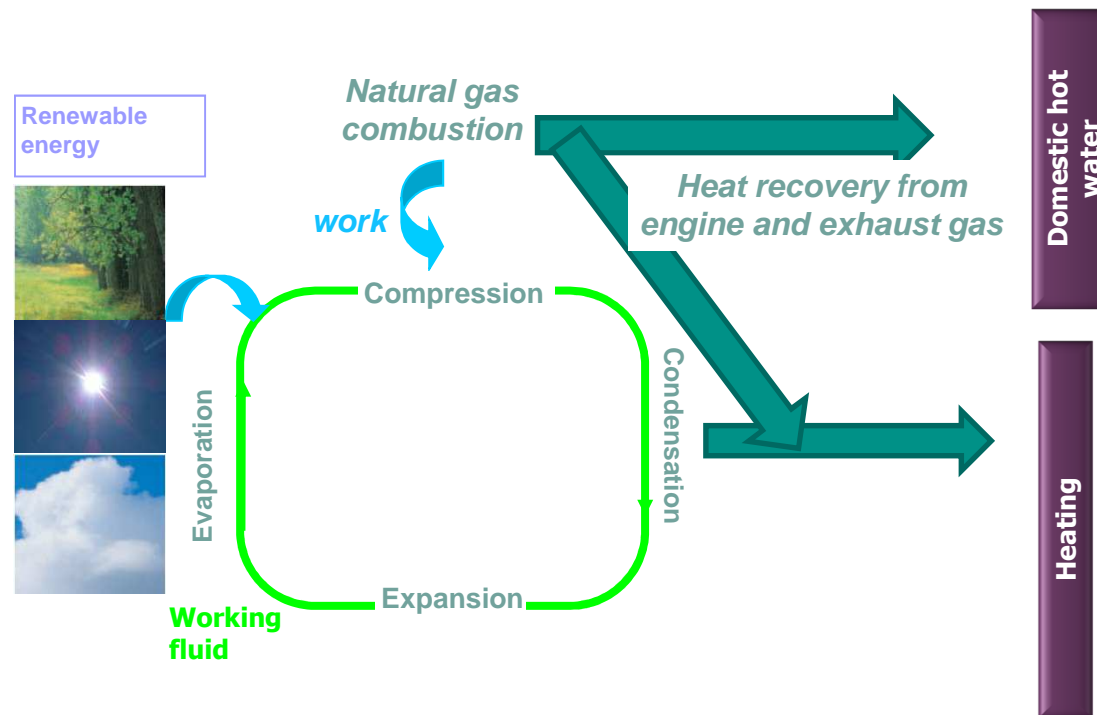
Engine driven heat pumps
Thermally driven heat pumps

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□ Engine driven heat pumps

■ Principle

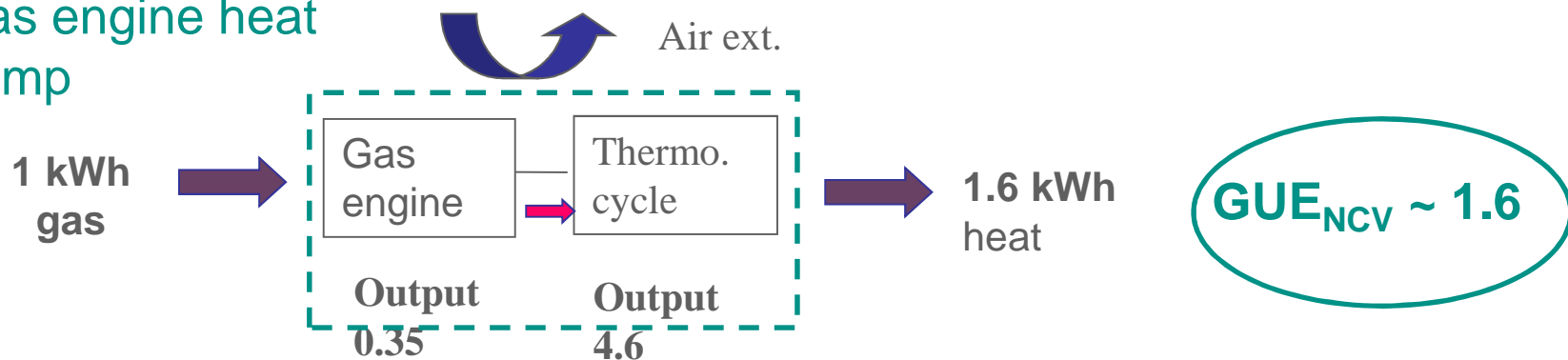
The compressor is driven by a natural gas engine



■ Energy efficiency : importance to evaluate a seasonal efficiency

Efficiency in stable conditions

Gas engine heat pump

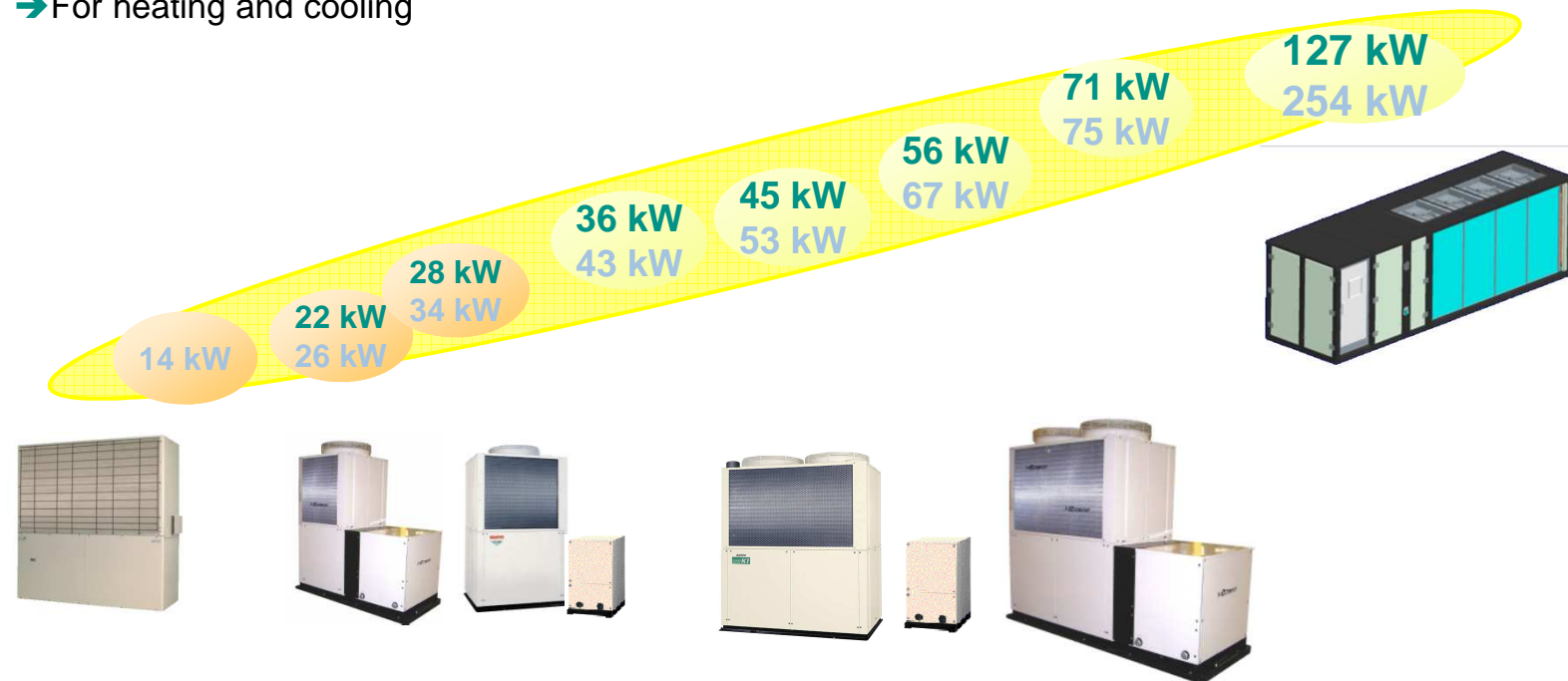


- ➔ Depending on the model, and the application (heating temperature), the nominal efficiency can vary between around 1.2 and 1.6 NCV (without heat recovery for DHW)
- ➔ The coefficients of performance (COP or GUE) also depend on outside air temperatures
- ➔ If the heat from the engine can be recovered to produce DHW for example, the efficiency increase (in stable condition we can achieve GUE higher than 2)

■ Product range

Gas engine driven heat pump

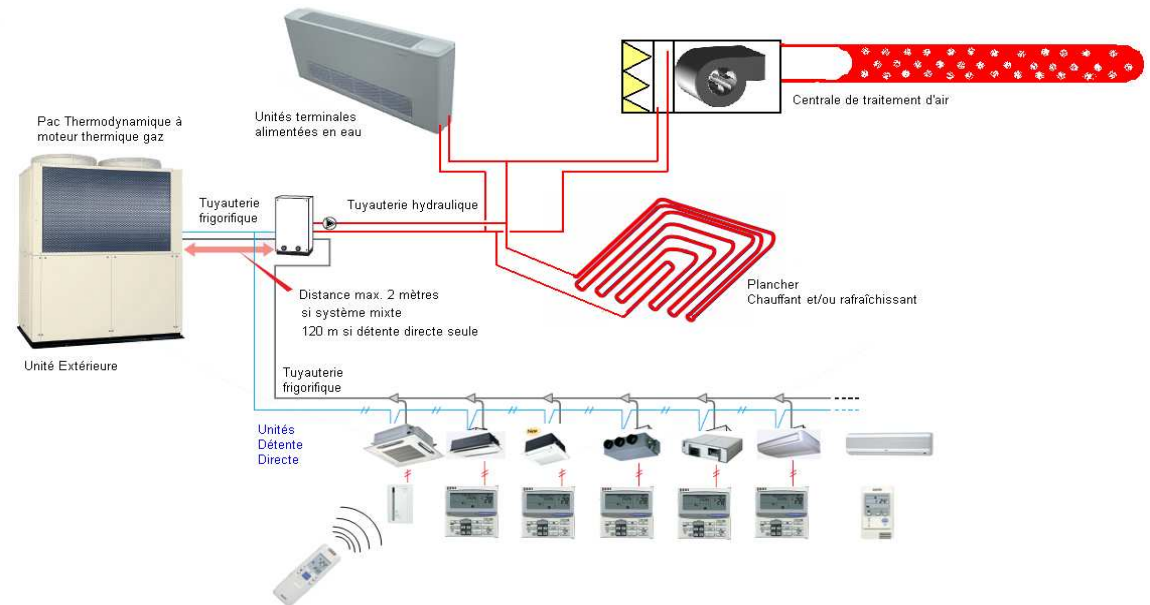
- SANYO, AISIN, YANMAR, SOPRANO
- Mainly Air/Air or Air/Water products
- For heating and cooling



■ Installation and maintenance

Installation

- GHP must be installed outside
- Air emission system
Or water emission at low temperature must be use
- Several units can be installed, with or without back up boiler



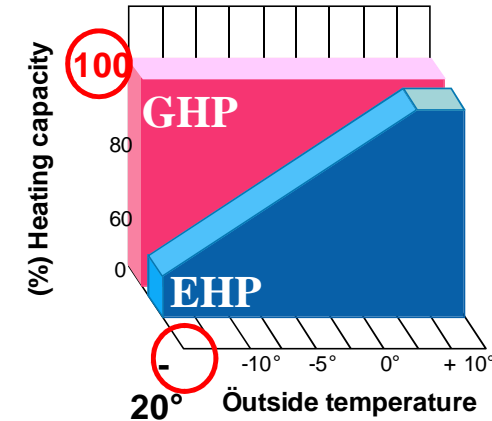
Maintenance : same as for electric heat pumps (EHP) + engine maintenance

- Usually every 10 000 h

■ Assets...but also difficulties

Advantages of the GHP

- Efficiency : high, particularly when the heat recovery can be fully used for domestic hot water
- GHP can maintain the capacity, even at low outside temperature
- GHP may contribute to a better energy mix to decrease the electric peak demand
 - What is becoming a more and more important problem on the European Grid
 - Electricity peak production is the highest CO₂ producer
- Running cost : depending of the country and the energy tariff, the low electricity demand is also an advantage on the economic aspect



But also some difficulties

- The investment and maintenance cost of the product are higher than EHP
- The technology is not very well known and well integrated in standards

■ Applications: mainly commercial buildings

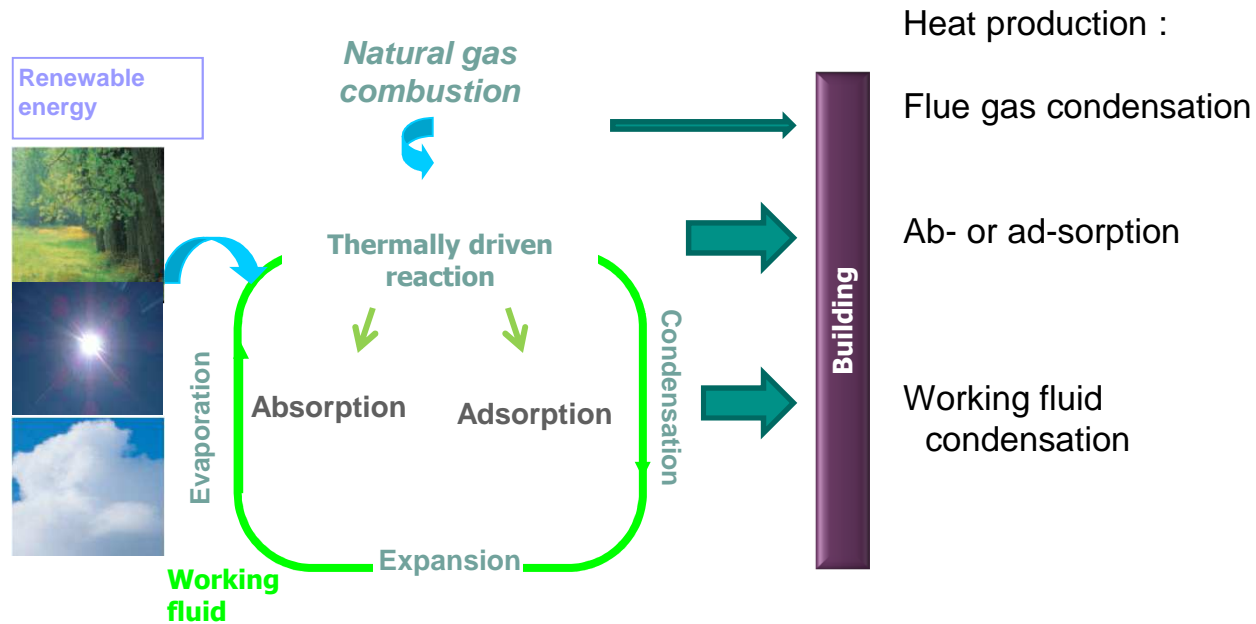
The product range and the ability to produce heating/cooling for building make the product very adapted to commercial buildings

- The main market is office
- But hostel, hospital, or housing with cooling needs are very interesting market because combine heating+cooling+DHW needs→ the heat recovery can be fully used
- Other market where there is opportunity : case of electricity providing problem

Estimation of around 10 000 units installed in Europe

□ Thermally driven heat pumps

■ Principle



Several renewable sources

→ Solar, aero-thermal, geothermal

Several couples Working fluid/sorbent

→ Absorption/adsorption

■ Assets and opportunities of thermally driven heat pumps

High performances in primary energy and CO2 emissions

Numerous technical arguments of GHP compared to EHP :

- A heat pump able to produce high temperature → 1 product for both heating and DHW with thermodynamic effect
- Natural working fluid without global warming potential
- Reduced surface area of sensors for ground source GHP (~2x)
- Capacity stability at low temperatures
- No defrosting cycle
- Reliability, quietness and easy maintenance (absence of compressor due to the absorption principle)

Cost competitiveness (both at Investment level and at Operation&Maintenance level)

- Stay the most important criteria particularly for individual housing

■ Present day : commercial buildings and collective dwellings

Absorption heat pumps

- ROBUR: Heat Capacity ~ 40 kW
- Air/Water or Water/Water version
- 30% to 40% energy saving compared to a condensing boiler
- Replace an old boiler easily as they can provide not only heating, but also domestic hot water
- ~ 6000 units working in Europe (june2010)

Products already available and the market is increasing.

2 Gas Absorption Heat Pumps for collective housing in North of France.



■ Tomorrow : Individual dwelling

MANUFACTURERS					
Type	Absorption	Adsorption	Adsorption (Zeolite)	Adsorption (Zeolite)	Absorption
Renewable source	Aerothermal	Aerothermal	Geothermal/solar	Solar	Geothermal
Priority market*	Existing dwellings	Existing/New dwellings	New dwellings	New dwellings	Existing/New dwellings?
Maturity	Prototype	Prototype	Field test	Market launch first quarter 2010 in Germany	Prototype

* does'nt mean that the technology is not adapted to other applications

To prepare the market :

- ➔ Laboratories test (to feed the efficiency calculation method...), field tests (demonstrations)
- ➔ Work to do for testing standards (EN12309-2 has to be adapted to these new systems,...)
- ➔ Integration of GHP for the European and National regulations and incentives

Thank you for your attention