

Presles, Soissons, France

Renovation of domestic hot water production in 12 social apartments in multifamily buildings located in area heated by district heating.

Key facts

Building

Location	<i>Soissons, France</i>
Construction date	<i>1975</i>
Heat distribution	<i>collective</i>
DHW production	<i>collective heat pump</i>
Heated area	<i>841 m² living</i>
Level of insulation	<i>average</i>

Heat pump and source

Number of	<i>1</i>
Installed power	<i>11kW</i>
Operation mode	<i>DHW only</i>
Heat source	<i>Outside air</i>
Brand and type	<i>Atlantic Hydrapac 2</i>
Refrigerant	<i>R410A – 2,5 kg</i>
Sound level	

Domestic hot water

Type of system	<i>central</i>
Max. temperature	<i>60 °C</i>
Hot water storage	<i>1500 l</i>
distribution system	<i>with a thermodynamic loop heater</i>

Other information

Electric energy consumption 2013 for DHW	<i>29 kWh_{ep}/m².yr</i>
Investments costs	<i>unknown</i>
Renewables ratio	<i>50%</i>

Some figures

- Before renovating, the primary energy consumption due to DHW production was about 75 kWh_{ep}/m².yr.
- Final objective for ep consumption is 24 kWh_{ep}/m².yr.

Lessons Learned

Estimated cost with an individual electric water heater at double price: € 10.20 including VAT per M3 (excluding cold water) Cost invoiced individually to tenants after installation of the HYDRAPAC solution at € 5.15 including VAT per M3 (excluding cold water)
Or 50% savings



In Soissons, the housing corporation Logivam manages 1.235 dwellings in multifamily buildings built in the 1975s in the ZUS district of Presles, connected to a rehabilitated district heating network supplied by a wood-fired boiler. Domestic hot water was produced by individual electric storage water heaters in each apartment. With the renovation Logivam wanted to transform this hot water production into a more economical system in order to reduce the energy bill.

The Atlantic solution chosen is HYDRAPAC, a collective heat pump water heater in a technical room in the basement, accompanied by the creation of a hot water distribution network to supply housing from this installation in the basement.

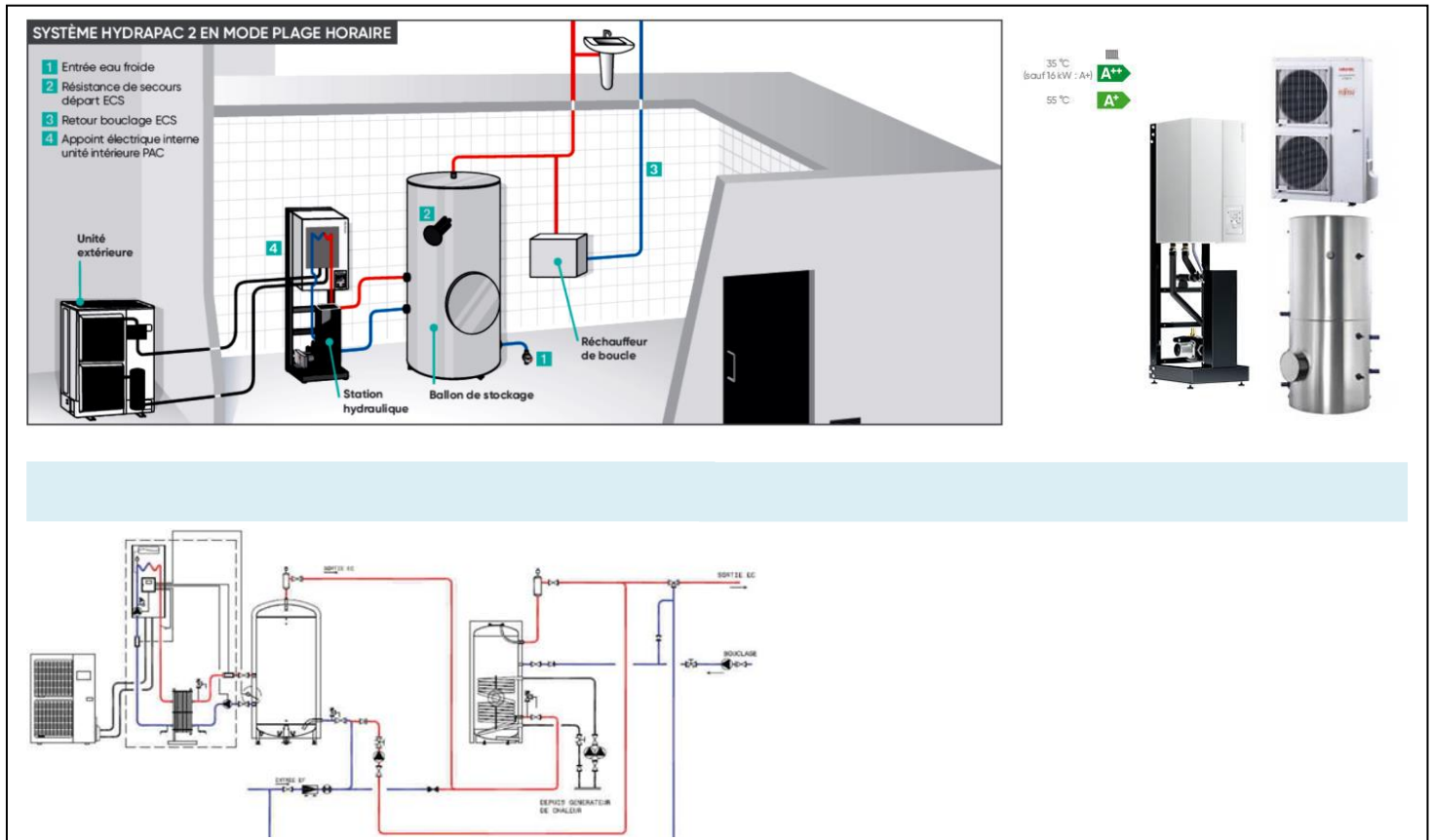
Commissioning was carried out in April 2012. The replacement of these individual solutions (in 12 dwellings) by a collective heat pump induces in a 50% reduction on the electric bill due to domestic hot water production.

The DHW production system operates in accumulated mode: the load makes it possible to store the pre-established daily needs. The heat pump then produces hot water at night, for 8 hours non-stop. Even if the outside temperatures are generally lower at night, operating during the night period offers certain advantages which guarantee better performance. On the one hand, after a day of undershoots, the volume of cold water in the balloon is significant and allows the COP of the system to be optimized (see curve). On the other hand, undershoots are less significant at night and do not disturb the heating cycle of the balloon. Finally, the night charge allows you to take advantage of off-peak electricity pricing.

The heat pump can supply water at 60° C up to an outside temperature of -20° C.

The advantage of driving the most progressive charge possible is to optimize the power consumed by the heat pump and therefore minimize electrical consumption. The goal is to reduce this consumption compared to that of conventional tanks, while producing the same amount of DHW. The ramp-up is ensured by the inverter regulator integrated in the heat pump.

Presles, Soissons, France, Technical details



Description of the technical concept

Focus on the DHW production system

Implementation:

- an 11 kW heat pump on outside air, installed above the service entrance at the rear of the building and an indoor unit near the storage tanks;
- a 1,500 L storage tank (ie 2 750-liter tanks because the room is cramped, 10 cm of glass wool insulation);
- a distribution loop maintained at temperature by a loop heater.

The system functioning is based on an accumulated mode : the storage tanks allow to store the daily DHW needs. Then, the heat pump produces heat during the night, for 8 hours continuously.

Even if the outside air temperatures are lower during the night, this type of operation offers advantages in terms of performances :

- After a day of draw-offs, the volume of water in the tanks is completely cold optimized COP;
- An operation during night allows to benefit from lower electricity tariffs.

Before the works, out of the 190 kWhep/m²/year consumed by the dwellings, the production of domestic hot water by the electric tank represented 75 kWhep/m²/year, or 40% of the primary energy needs.

The objective of the renovation was to reduce the electricity bill for the production of domestic hot water with new consumption for DHW estimated at 35 kWhep/m²/year.

After an initial operating phase (February 2013 to July 2013), an initial assessment was carried out. The primary energy consumption Cep extrapolated over the year reached 29 kWhep/m²/year. The functioning of the system was satisfactory with an input of renewable energy greater than 50%.

Nevertheless, room for improvement seemed possible. The reduction of static losses and loop losses was a possible lever to reduce the primary energy consumption of the installation. The target consumption was then 24 kWhep/m²/year.

To reach it, the outlet temperature of the heater was lowered to 55 °C and the loop flow adjusted to respect a return to 50 °C. The insulation was not changed, but an insulation thickness of 20 mm instead of 9 mm would also have been relevant to reduce energy consumption.