Bourderies, Nantes, France

Construction of 32 social housing units with very low energy consumption, near Nantes, equipped with individual Heat pump water heater on collective exhaust air ventilation system.

Key facts

Building

Location	Nantes, France
Construction	2014
Heat distribution in building	
Heated area	2805 m² living
Level of insulation	see description

Heat pump and source

Number of heat pumps	32
Installed capacity	1.5kW
Operation mode	monoenergetic
Heat source	Ventilation air
Brand and type	Aldes T. Flow Hygro
Refrigerant	850 gr - R134a
Sound level	21 dB

Heating system

Heat demand	electric panels
Heating temperature	30°C

Domestic hot water

Type of system	Ventilation air
Max. Temperature	°C
Circulation system	individual
Legionella measures	
Storage size	200 litres
Number of storage tanks	32
Storage losses	
Temperature control	

Other information

Electric energy	
Consumption year	kWh
Investments costs	€ 3,262,060 excl. Tax -

Subsidies: € 459,379 by the State, the General Council, Nantes Métropole, the City of Rezé and CIL Housing Action

PV installation	340 m²
Solar thermal	none

Lessons learned

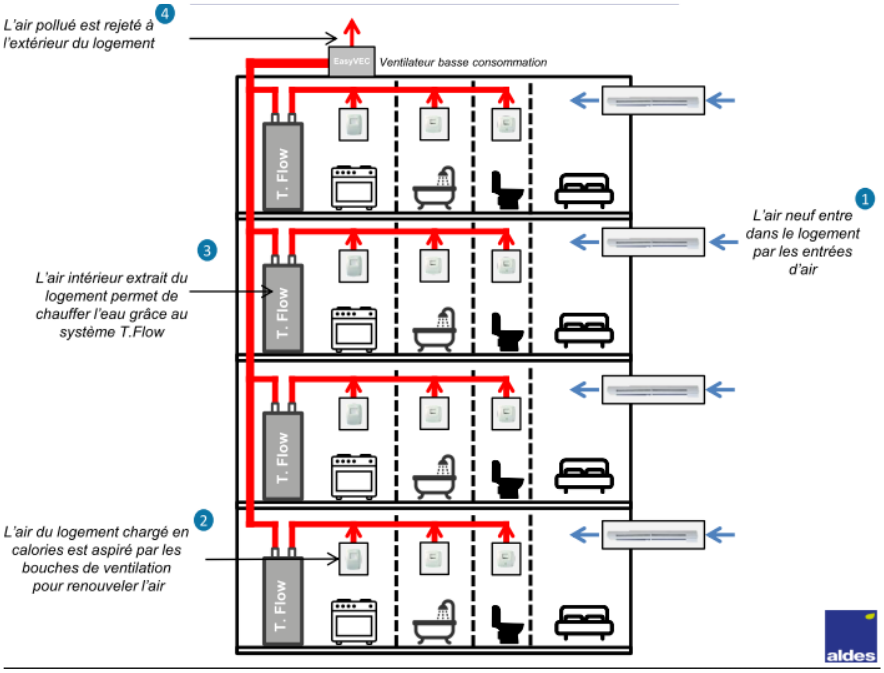
Source: Aldes

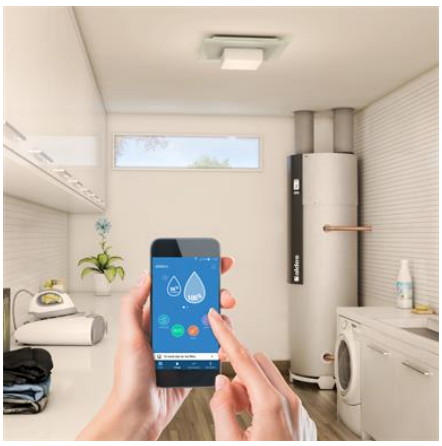
Building process

Construction of 32 social housing units built for Atlantique Habitations with very low energy consumption, near Nantes. The 32-unit building divided is into 2 buildings resting on a semi-underground parking base. A constructive system, composed of metal structures associated with reinforced insulation and airtightness, and individual heat pump water heaters on a collective exhaust air ventilation system made it possible to carry out the 1st operation labelled BEPOS Effinergie. A BEPOS: building is producing more energy than it consumes, all uses combined on average over a year.

Before considering BEPOS, the goal was to design homes with very low heating needs. For this purpose, a bioclimatic design was favoured, and we produced a particularly insulated and airtight envelope. The skeleton of the building is made up of metal frameworks, it is covered, on the outside, with mantle walls in insulating wooden frame and with metal cladding, and inside an insulating lining, i.e. insulation of 20.5 cm. Thus, thermal bridges are limited to the extreme and air tightness is effective (0.6 m3 / h.m², or 40% below the requirement). We then proposed to the contracting authority to aim for the BEPOS label, by adding 212 photovoltaic solar panels (340 m²). The heating needs being very limited the energy system is all-electric. In order to meet the requirements of the BEPOS Effinergie label an efficient technical solution to ensure the production of domestic hot water was developed. Idéfia had already carried out two fully electric operations with heat pump water heaters on extract air and, with the authorization of the contracting authority, had followed up with tenants equipped with a consumption display. The results were very favourable: the tenants of a T3 paid on average 462 euros of electricity per year, including specific electricity consumption. This allowed Idéfia to be proactive, especially since the new model, T. Flow Hygro + offered by Aldes, is even more efficient (the electric bill will be even lower) and particularly silent.

Bourderies, Nantes, France, Technical details





Installation principle in des Bourderies and easy of use by customer with telephone app

Description of the technical concept

The competition, for this operation on the ZAC des Bourderies, requested connection to the recently created local heating network. We proposed an all-electric technical-economic variant because, thanks to the construction mode, the heating needs were significantly reduced: radiant panels for heating and Heat pump water heaters for DHW production. In addition to the quality of the envelope, the individual production of DHW by heat pump water heater combined with humidity controlled ventilation enhanced thermal performance: air renewal according to the humidity level, automatic operation of the water heater as required in hot water and hourly pricing, only one subscription in relation to the heating network, preheating of the water stored by the calories recovered from the extracted air, installation in heated volume, length of the DHW distribution pipes limited.

We carried out the first thermal calculations from a standard product. Obviously, the coefficient of performance of 4.01 (COP) of the T.Flow Hygro + further improved the results. In addition, the 200 litre hot water storage tank has reinforced insulation (55 mm), which allows it to retain maximum heat. Hourly thermal shocks are triggered automatically to avoid the proliferation of legionella (consumption taken into account in BEPOS calculations), as well as the additional resistance, soapstone of 1500 W, in case of punctual need. All of these improvements have resulted in an all-electric positive energy building

Results in brief

- BBio: 24.30 for a maximum Bbio of 60.
- Cep (without electrical production): 40.97 kWhep / m².year for a maximum Cep 69.90 kWhep / m².year.
- Cep (with electrical production - solar panels): -16.63 kWhep / m².year for a Cep max 57.90 kWhep / m².year.
- Tic (summer comfort): 27.10 ° C for a Tic max 30.10 ° C.
- BEPOS effinergie label
- Furniture and other uses (media, household appliances, etc.): 70 kWhep/m².year.
- EPNR balance sheet (non-renewable primary energy): 53.44 kWhep/m².year for an authorized difference of 55.25 kWhep/m².a