

Paddepoel, Groningen, Netherlands

A first: Renovation of apartment becomes zero energy on the meter by installing individual air to water heat pumps in the 48 apartments and high-quality solar panels on the roof of the complex.

Key facts

Building

Location	Groningen, Netherlands
Construction	October 2016
Heat distribution	Individual hydronic radiators
Heated area	50 m ² living
Level of insulation	Energy Zero Building

Heat pump and source

Number of heat pumps	48
Installed capacity	4 kW
Operation mode	monoenergetic
Heat source	air source
Brand and type	Mitsubishi Ecodan
Refrigerant	R410A
Sound level	45 dB

Heating system

Heat demand	
Heating temperature	40°C

Domestic hot water

Type of system	individual
Max. Temperature	60°C
Circulation system	individual
Legionella measures	thermal
Storage size	100 litres
Number of storage tanks	48
Storage losses	
Temperature control	

Other information

Electric energy	
Consumption year	kWh
Investments costs	unknown
PV installation	550 panels 316 Wp/panel 173,250 kWh/a
Solar thermal	none

Sources:

[Building process](#)

Gawalo article [16 feb 2016](#)

[Dutch Heat Pumping Technologies Journal Vol 1](#)



At first glance, the houses in the Paddepoel district now seem to be new-build homes. The facade is almost flawless and once inside it still smells like new. But the 48 flats on Voermanstraat and Pleiadenlaan are really decades old. However, the renovation was thorough.

Retrofitting existing Dutch housing stock to make it more sustainable is a real challenge. Apartments are difficult to insulate and have insufficient space available for PV panels and the installation of air to water heat pumps. In Groningen, contractor Dura Vermeer, installation company Klein Poelhuis and housing corporation Lefier worked together to develop a solution. Alklima/Mitsubishi Electric, directly involved in the project, provided input for using Ecodan air to water heat pumps. The solar panels were installed on the roof of the complex, the placing of the heat pumps proved to be one of the more complex challenges at the complex.

To retrofit to 'energy zero' the façade of the building was completely pre-fabricated and installed in a short working process convenient for the inhabitants. The front and rear façades were provided with insulated wall panels, the roof was fitted with additional insulation, triple glass was installed and the balconies were 'shifted inwards' to keep the winter weather outside.

With this special renovation, Dura Vermeer won the Dutch Sustainable Building Award in February 2016.

The project's name & country, Technical details



Hot water storage tank (100 litres) with smart metering inside storage cabinet in each apartment



In the project, an individual heat pump was chosen, of which the indoor unit will replace the old gas boiler.



Casings at the entrances to accommodate three Mitsubishi air source evaporators.

Description of the technical concept

An indoor unit of a heat pump system needs more space than a traditional gas boiler which delivers instantaneous hot water. Particularly the storage tank needed for hot water was a challenge. In this project, no additional space could be freed up for the technical areas. However, this was resolved by using a compact yet service-friendly system, thus the in-house heat pump system took up no more space than the old gas boiler. Another challenge was that the existing high temperature radiators needed to be retained. However the high-quality wall insulation meant that this was no problem. A third challenge was where to put the individual outdoor units for 48 heat pumps. Siting the units on the roof was not an option because the PV panels were already planned for the roof. In the end: Each housing column of three floors of apartments has its own entrance to the garage units in the plinth of the complex. A casing was placed at the entrances to accommodate these apartments' three outdoor units. This had multiple advantages: the casing provided sound proofing, the outdoor units were hidden from sight.

Together with the buffer tank, this is a slightly larger installation than the gas boiler that the resident was used to at this location. The existing radiators are used in the living room and three bedrooms for heating. In combination with the solid insulation and airtightness, and balance ventilation with heat recovery, it is good to heat despite the lower water temperature of the heat pump compared to the gas boiler. The storage tank sizes are 100 – 150 litres and sufficient for daily use.



Installing PV panels –

