Smartes Quartier Karlsruhe-Durlach, Ersinger Straße 2

The building forms part of a cluster of five large renovated multi-family buildings from the 1960s within the Karlsruhe district Durlach, where an integrated energy system is demonstrated within the research project “Smart district Durlach”.

The demonstrated heat pump technology features finned PVT collectors as single source for the heat pump system. Ultrafiltration are units are integrated in the drinking water circuit to allow low temperatures and maintain the hygienic requirements. 13 out of 150 radiators were exchanged to allow a heating temperature reduction to 55/45 °C.

Key facts

Building
Location Karlsruhe-Durlach, Germany
Construction 1965
Heat distribution radiator heating
Heated area 2112 m² living
Level of insulation good (renovation in 1995)

Heat pump and source
Number of HPs 1
Installed power 55.4 kWth
Operation mode bivalent
Heat source PVT collectors (solar+ambient)

Heating system
Heat demand ca. 60 kWh/m²a
Heating temperature 55/45 °C

Domestic hot water
Type of system central
Max. temperature 55 °C (with UF)
62 °C (without UF)
Circulation system yes

Other information
Investments costs not yet known
PV installation yes (PVT)

Lessons learned
Scientific monitoring has just started recently

The building was originally built in 1963 and renovated in 1995. The building features a heated floor area of 2112 m² on 5 floors with a total of 30 apartments. The building was renovated exchanging the windows with insulating glazing (Uwin = 1.7 W/m²K), and adding layers of thermal insulation (styrofoam, d = 60 mm, l = 0.035 W/mK) to the façade, cellar and to ceiling, thus reducing the overall U-value of the opaque envelope from Uenvelope = 1.71 W/m²K to 0.323 W/m²K.
Case Studies
Heat Pumps in Multi Family Buildings

Smartes Quartier Karlsruhe-Durlach, Ersinger Straße 2

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- Heat pump system
  - Heat pump technology
    - 55.4 kWth brine-water heat pump
    - High temperature heat pump with max. supply temperatures: 75 °C
    - Waterkotte IL EcoTouch
    - Tandem-Scroll with two power stages
  - Heat source:
    - Consolar Solink
    - PVT collectors with finned heat exchanger
    - 202 m² collector area
    (East and west orientation)
  - Bivalent system with condensing gas boiler as back up (bivalent parallel operation)
  - Two drinking water storages (2x 850 l)
  - One heating buffer storage (850 l)
  - Heat pump integrated into district energy systems via SG ready to allow optimization of self-consumption of PV and CHP electricity

- Low Ex Measures:
  - Heat distribution system:
    - Original radiators are mostly sufficient to allow a reduction of nominal heating temperatures
    - 13 of 150 radiators were identified as “bottleneck” radiators. These radiators are exchanged with radiators of larger heating power
    - Reduction of heating temperatures to 55/45 °C
    - Hydronic balance
  - Domestic hot water distribution:
    - Two external freshwater stations
    - Circulation
    - Ultrafiltration (UF) to reduce hot water temperatures from 62 °C to 55 °C
      (pilot project)

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