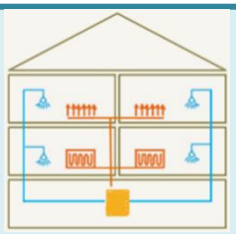
St-Julien, Geneva, Switzerland



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This retrofit of a 1972 building counters HP-sceptics' arguments on many different levels. Except for the roof, no renovations took place, the existing heat distribution system (including the radiators in the dwellings) remained and the back-up oil boiler was removed after two years without being used.

Key facts

Building

Location	*Geneva, CH*
First Construction	*1972*
Project type	*retrofit*
Heat distribution	*radiators*
Heated area	*4049 m² living*
Level of insulation	*poor (roof retrofittet)*

Heat pump

Number of	*2*
Heat source	*ambient air*
Installed power	2 x 156 kW (A-7/W65)

Heating system

Operation mode	*HP only*

Space Heating

SH %, demand	58%, 77 kWh/m²/y
Heating temperature	*55 °C (@ -5°C ext)*

DHW

DHW %, demand	42%, 55kWh/m²/y
Max. temperature	*60 °C*
Circulation system	*yes*

Other information

HP share	*100%*
SPF	*2.3*
Ventilation	*single-flow*

Lessons learned

- HP-only systems can be installed in poorly insulated buildings with no interruptions for the residents
- EL auxiliaries (pumps) can greatly reduce system performance if not properly regulated
- Pay attention to DHW loops as they are sources of significant losses, both in terms of heat and temperature
- Industrial HPs are cheap but need consequent noise-reduction installation
- Avoid oversizing: measure the building's demand prior to the project to size the system accordingly

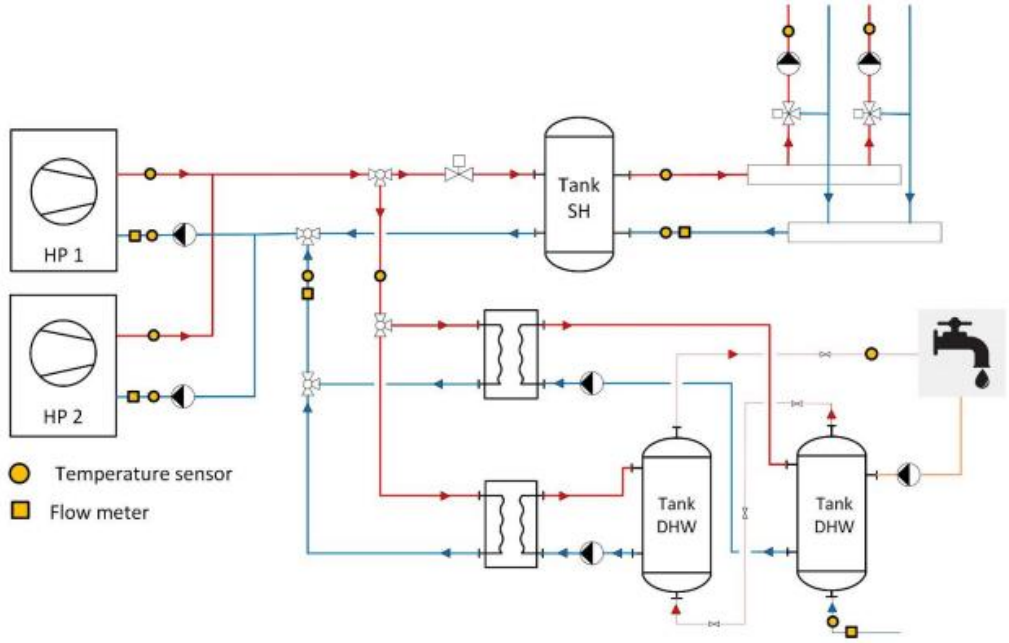
This existing MFH (multi-family building), built in 1972 in Geneva, contains 53 apartments over eight floors. It suffered no major envelope retrofit before this project and the total oil consumption amounted to 700 MWh/yr (for space heating and domestic hot water of its 4'049m² of heated area). *(Photo credit SIG, CSD Ingénieurs SA)*

It is now equipped with a monovalent system comprising two industrial-type air-source HPs. In the last year of monitoring, the annual SPF was 2.3, including auxiliaries, with DHW consumption accounting for almost half of the total heat requirement. Operating errors were detected during the first year of monitoring, due to incorrect device settings, and were largely rectified by optimizing the control strategy, improving the system's performance since commissioning.

A 300 kW back-up oil boiler was initially kept in the system but after two years of monitoring it proved utterly useless and was removed.

St-Julien, Geneva, Switzerland, Technical Details

Hydraulic scheme of the system



Description of the technical concept

The heating system comprises a 1 m3 storage tank and two SH distribution circuits (northwest and southwest). Each SH distribution circuit has its own three-way valve and circulator. On the other hand, the DHW subsystem comprises two 1 m^3 storage tanks connected in series, separated from production by two plate heat exchangers.

The 2 industrial-type HPs supply heat for SH and DHW alternately to maintain the storage tanks at their set temperatures. The heating and DHW setpoints are fixed at the top of each storage tank and verified by a temperature sensor. A motorized isolation valve directs HPs heat production to the DHW subsystem or to SH circuits. When HPs are in SH mode, the valve remains open to send the heat production to the SH circuits. When in DHW mode, the valve is closed and all the HPs heat production is directed to the DHW plate heat exchangers. In the event of simultaneous demand for DHW and heating, priority is given to DHW.

Final report: CALAME, Nicole et al. (2021). AirBiVal: Développement et optimisation de concepts hybrides de pompes à chaleur sur l'air pour des immeubles résidentiels collectifs. Url: https://archive-ouverte.unige.ch/unige:156969