La Fontenette, Geneva – Switzerland

A centralized wastewater HP with a complementary gas boiler, for a high performance multifamily buildings complex, with heat distribution via a dedicated district heating system.

Key facts

Building

Location	*Geneva, Switzerland*
Construction	*2015-2020*
Type	*Multifamily building*
Heat distribution	*Underfloor heating*
Heated area	*30'440 m²*
Level of insulation	*High performance*
Heat production	*2 GWh/y (67 kWh/m²/y)*
N° of apartments	*120*

Heat pump and source

Number of HP	*1*
Installed capacity	*200 kW_{th}*
Operation mode	*Bivalent with a 600 kW gas boiler*
Heat source	*Wastewater from the buildings*

Heating system

SH share, demand	*37%, 22 kWh/m²/y*
Heating temperature	*Max. 35°C at -5°C*

Domestic hot water

DHW share, demand	*63%, 43 kWh/m²/y*
Type of system	*Central per building*
Max. temperature	*63°C*
Circulation system	*Yes*

Other information

HP share, SPF	*53%, measured: 3.0*
Investments costs	*CHF 91.-/m²*
Heat cost (LCOE)	*CHF 10.-/m²/year*
PV installation	*210 kWp*
Double-flow vent.	*80% efficiency*

Lessons learned

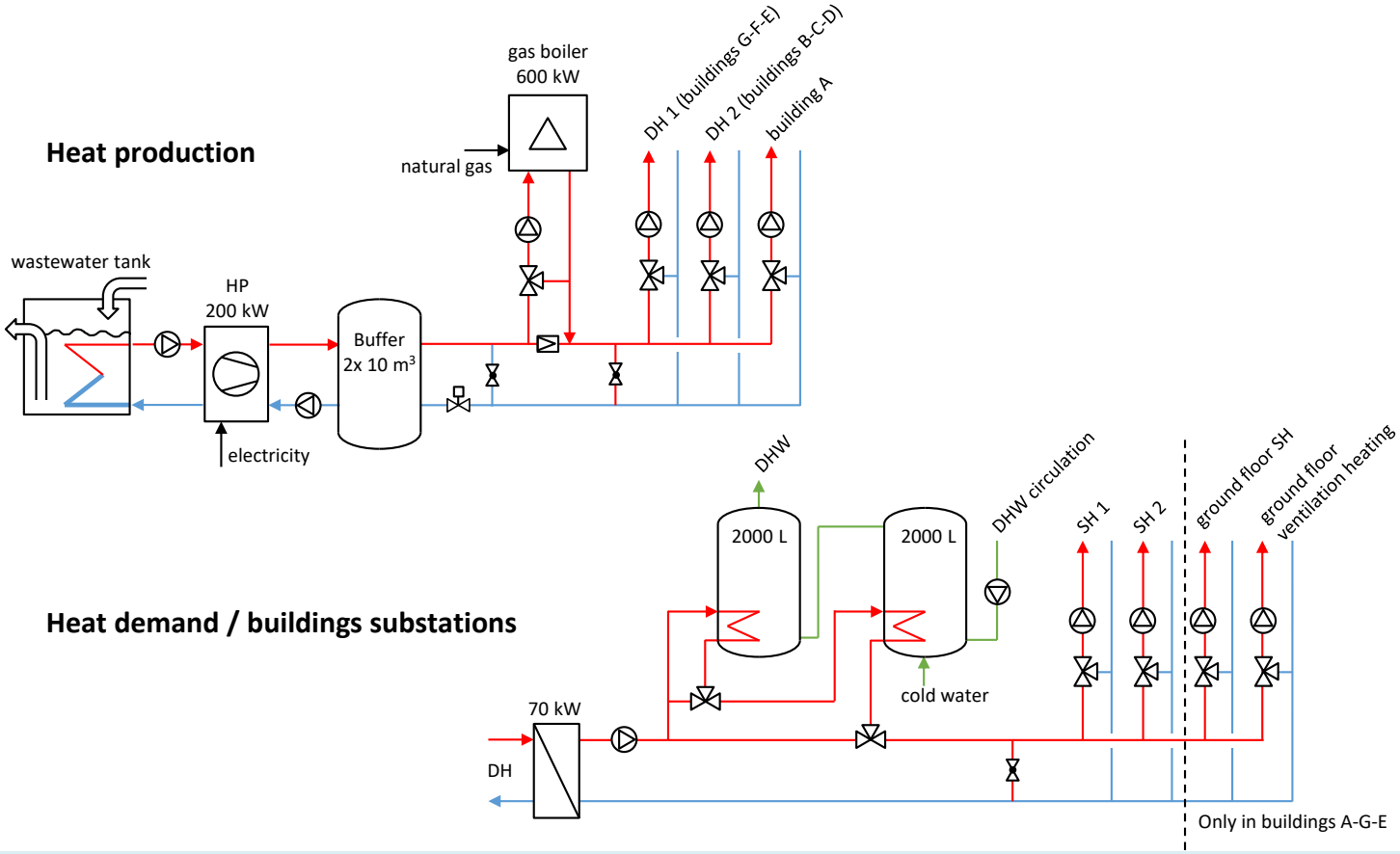
- Use of innovative HP source (wastewater) in combination with fossil fuels needs careful cooperation of stakeholders regarding the system's regulation and its optimization.
- HP covers a high share of the heat production with this local heat source.

While heat pump systems combined with district heating could reduce the CO_2 emissions of Geneva's heating sector, it is crucial to know and control their performance in real condition of use.

We monitored this new low energy multifamily buildings complex for 3 years.

SH demand and DHW supply are higher than planned/normed values. For SH that can be explained by operation conditions which differ from the norm (higher indoor temperatures, window openings), and DHW supply is certainly high, but coherent with a benchmark on other buildings in Geneva.

La Fontenette, Geneva – Switzerland: Technical details



Description of the technical concept

Wastewater from the 7 buildings is collected in a common tank (37 m^3), which contains: a filtration system to retain and remove the solid materials; as well as an immersed heat exchanger (FEKA system). HP evaporator is connected to this submerged heat exchanger via a glycol-water circuit.

The heat produced by the HP is transferred to a buffer stock. Additional heat is provided by a condensing gas boiler located downstream of the buffer stock. A motorized valve regulates the primary flow through the buffer stock (DH return). Heat is produced in a centralized boiler room and is distributed to the buildings via two heating networks.

DH supply temperature is set to meet SH needs (max. 40°C), and raises above 60°C several times a day to enable DHW production and storage in the buildings. This is done to improve heat production performance (mainly for the HP) and limit distribution losses.

Heat production operates according to the following two regimes:

- HP production: this mode is used when the HP and its stock are able to meet the DH demand (in terms of power and temperature).
- Gas boiler production (with HP isolated from distribution): this mode is used when HP and its stock can no longer meet DH demand (in terms of power and temperature). In this case, HP is isolated from the boiler and DH to prevent the boiler from heating the stock via DH return. HP then operates in a closed loop, to recharge the buffer stock, and stops when reaching its maximum setpoint temperature.

Final report: CALLEGARI, Simon Augustin et al. (2021). La Fontenette – « Les Auréa » : Analyse technique et sociale d'un complexe d'immeubles HBM de haut standard énergétique, équipé d'une PAC centralisée sur eaux usées.
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