Reducing peak flow by use of plate heat exchangers for hot water preparation

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Discussion with operator regarding DHW production

District Heating Operator → Preference for Water Tanks

- Lower flows in service pipes which allow smaller diameters (DN 16 instead of DN 20-25)
- Lower peak flows in the system
- Lower heat losses in service pipes, which account for the majority of heat losses
- Lower investment overall
Discussion with operator regarding DHW production

Research in 4GDH → Instantaneous production by means of plate heat exchangers

– They can function with very low supply temperatures (50-55°C)
– Very low return temperatures (10-20°C)
– No risk of legionella
Research question

What are the effects of both DHW solutions in a 3rd Generation network in terms of flow and temperatures?
Methodology

– Demand of DHW based on stochastic approach
– Realistic model of a plate heat exchanger but simplified (no valves)
– Simplified model of a hot water tank
– Gradient algorithm (Todini) for hydraulic network
– Benonysson’s node method for thermal model with heat losses by van der Heijde et al.
Flow in transmission pipe during the coldest days

- Flow with PHE
- Flow with WT
Flow in transmission pipe in March

- Flow with PHE
- Flow with WT

Flow (L/min) vs. Time (h)

Flow (m³/h)
Flow comparison between WT and PHE

Ratio maximum flow with PHE / maximum flow with WT vs DN (mm)
Conclusions

- Water tanks lead to higher peak flows in transmission and distribution network

- Water tanks give similar/higher investment costs despite smaller service pipes

- Plate heat exchangers render lower heat losses and increase efficiency in production.

- Plate heat exchangers pave the way for the 4th Generation