New solution for supplying domestic hot water at comfort temperature without Legionella

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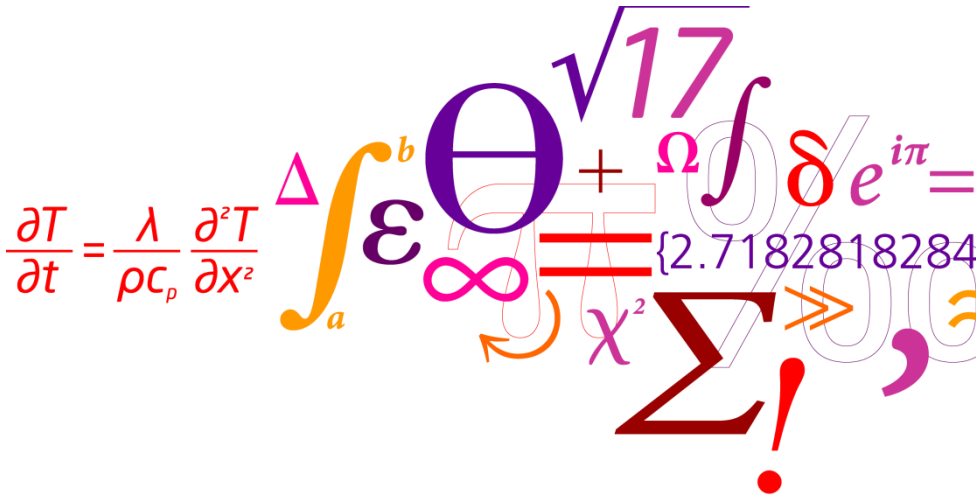
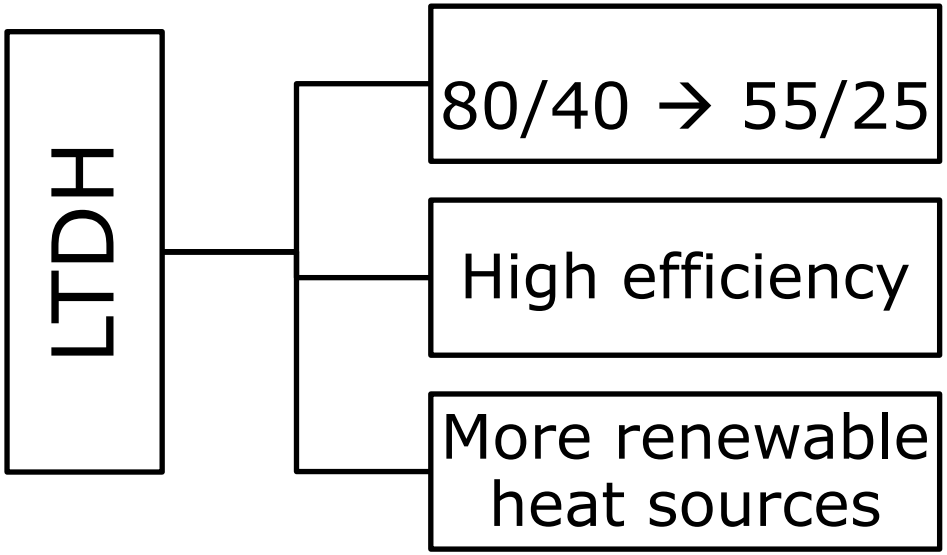


About low temperature district heating



But Legionella

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Temperature regulations today

- For *small system** without circulation:

  no temperature requirements

  *a volume <3L in pipe between heater outlet and draw off point

  - W551

- For *large volume systems with circulation:*

  the temperature of the DHW pipes should be at 55 ° C or 45° C during tapping periods

  -DS 439

  -DS/CEN/TR 16355

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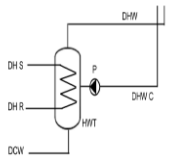
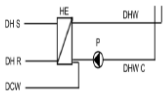
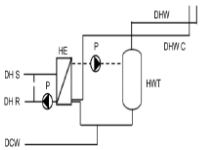
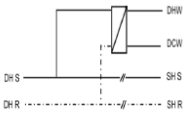
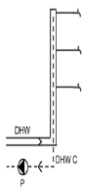
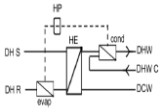
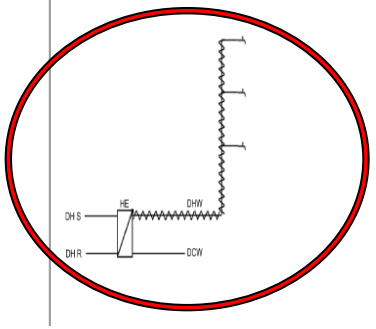
Alternative solutions for different types of buildings

Current methods of DHW supply

	X	X	X	X	X
	X	X	X		X
	X	X	X	X	X
					

Alternative methods

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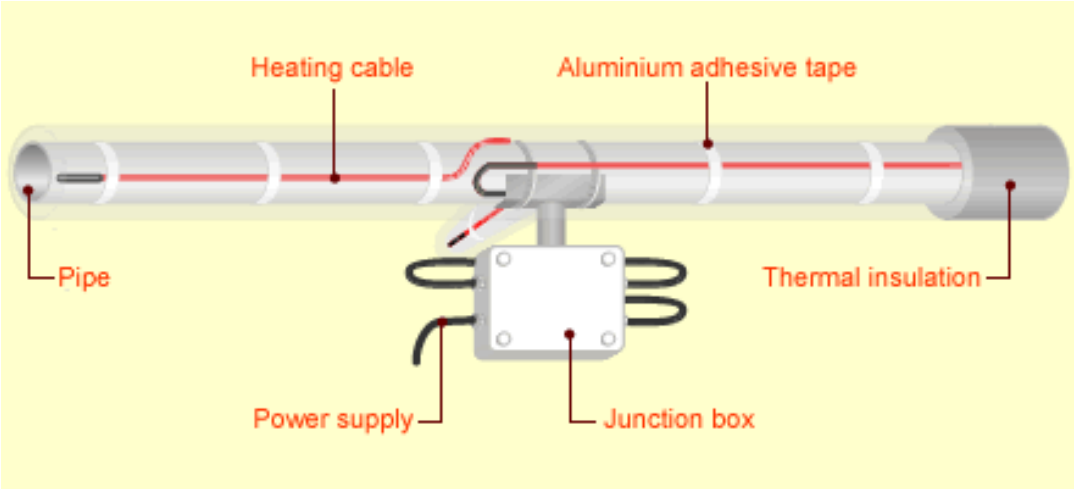
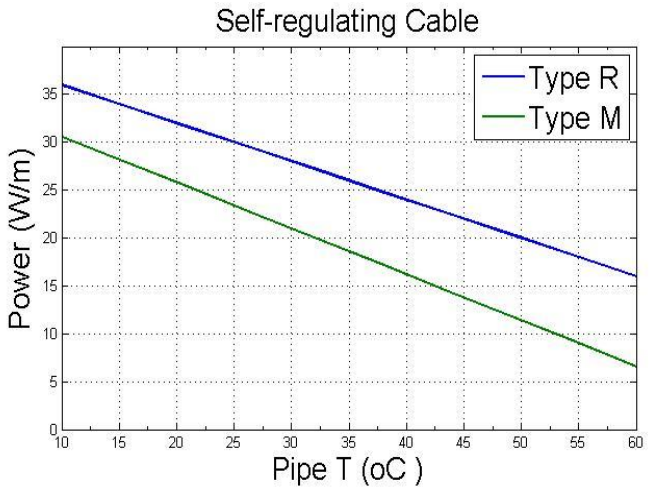
Case study using electric tracing

Difference by electric tracing:

- Circulation is not necessary
- Self regulating power
- Controlled follow user profile





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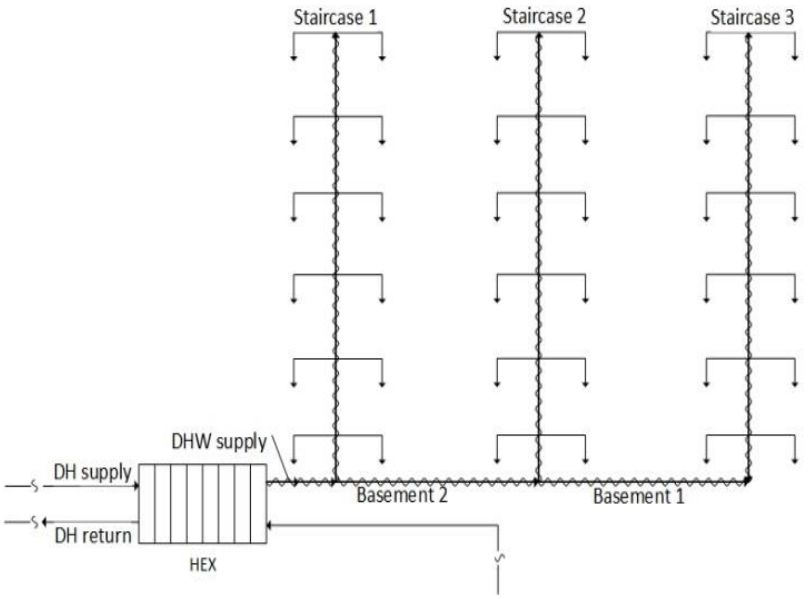
Case study using electric tracing

- Building/system information
  - 3 staircases
  - 6 floors each staircase
  - 2 apartments/floor
  - Horizontal pipe length in the basement: 20m
  - Distribution pipe length/floor :3m/floor
  - Flat area 50 m^2



- Design temperatures
  - 45^{o}C of DHW from heat exchanger - DH network at 50^{o}C
  - 10^{o}C for basement, 20^{o}C for above floors
  - Operative temperature follows DS439/16355

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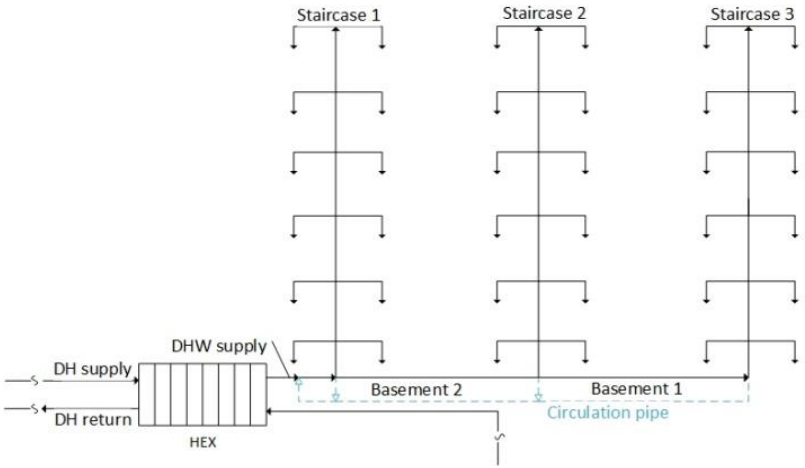
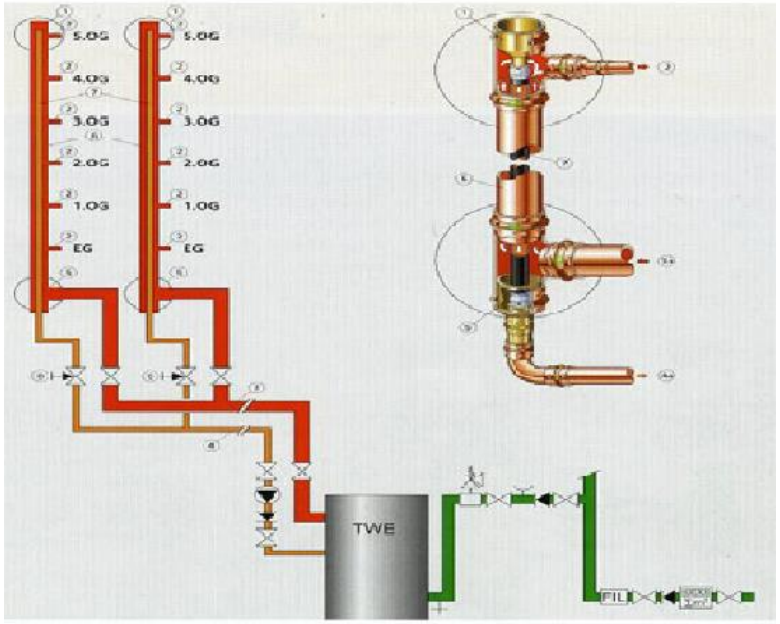
Reference case with pipe-in-pipe circulation

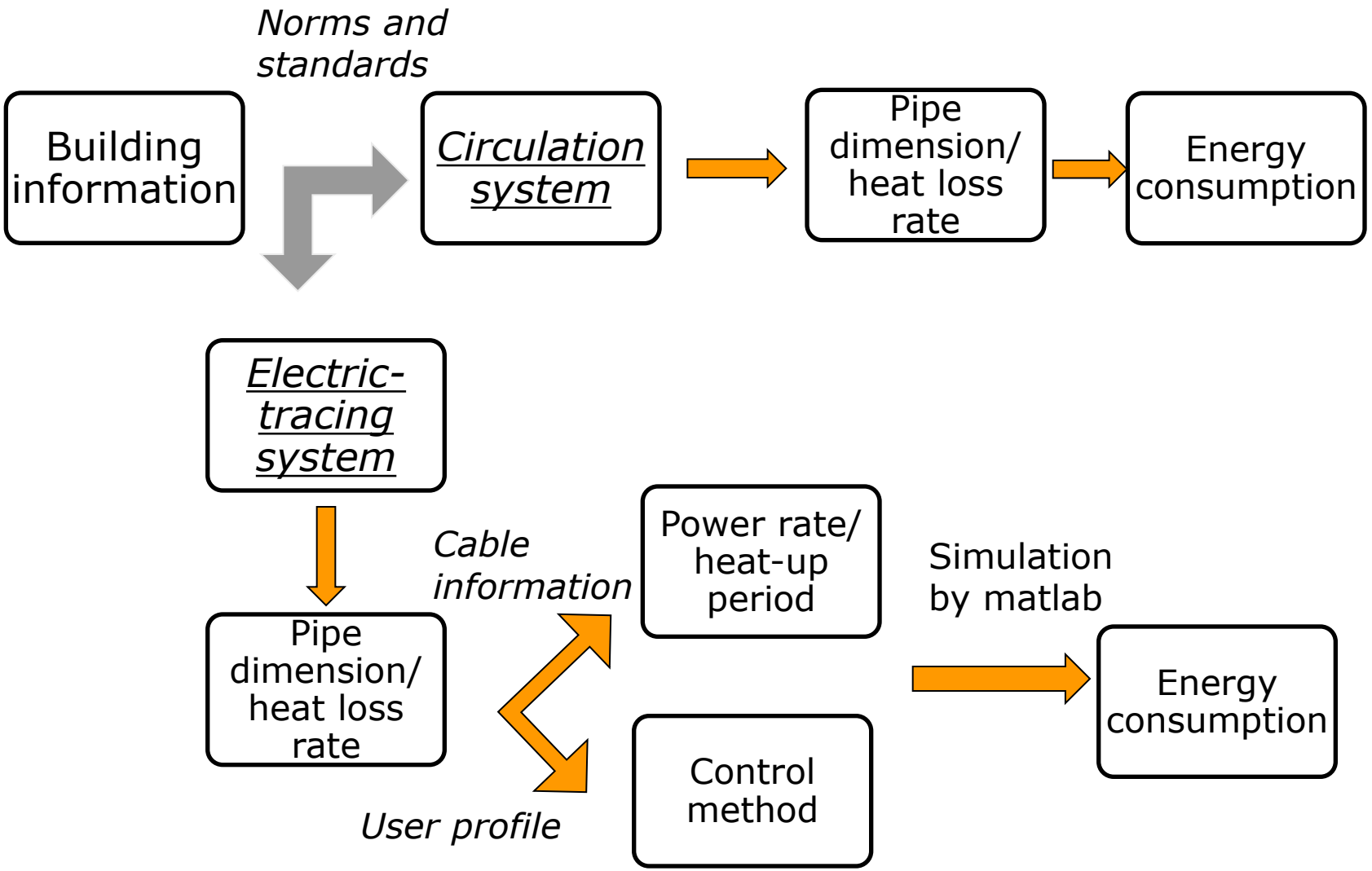
Pipe-in-pipe circulation

- Using the same supply system as El-tracing scenario
- Circulation run all the time to keep DHW at 55 ^{o}C
- All the dimension and simulation follows DS439/452





Simulating electric tracing process



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Simulating electric tracing process

Wanted results

- Heat up time
- Total electricity consumption
- Heat loss
- Energy saved for DH network
- Energy performance compared with standard requirement

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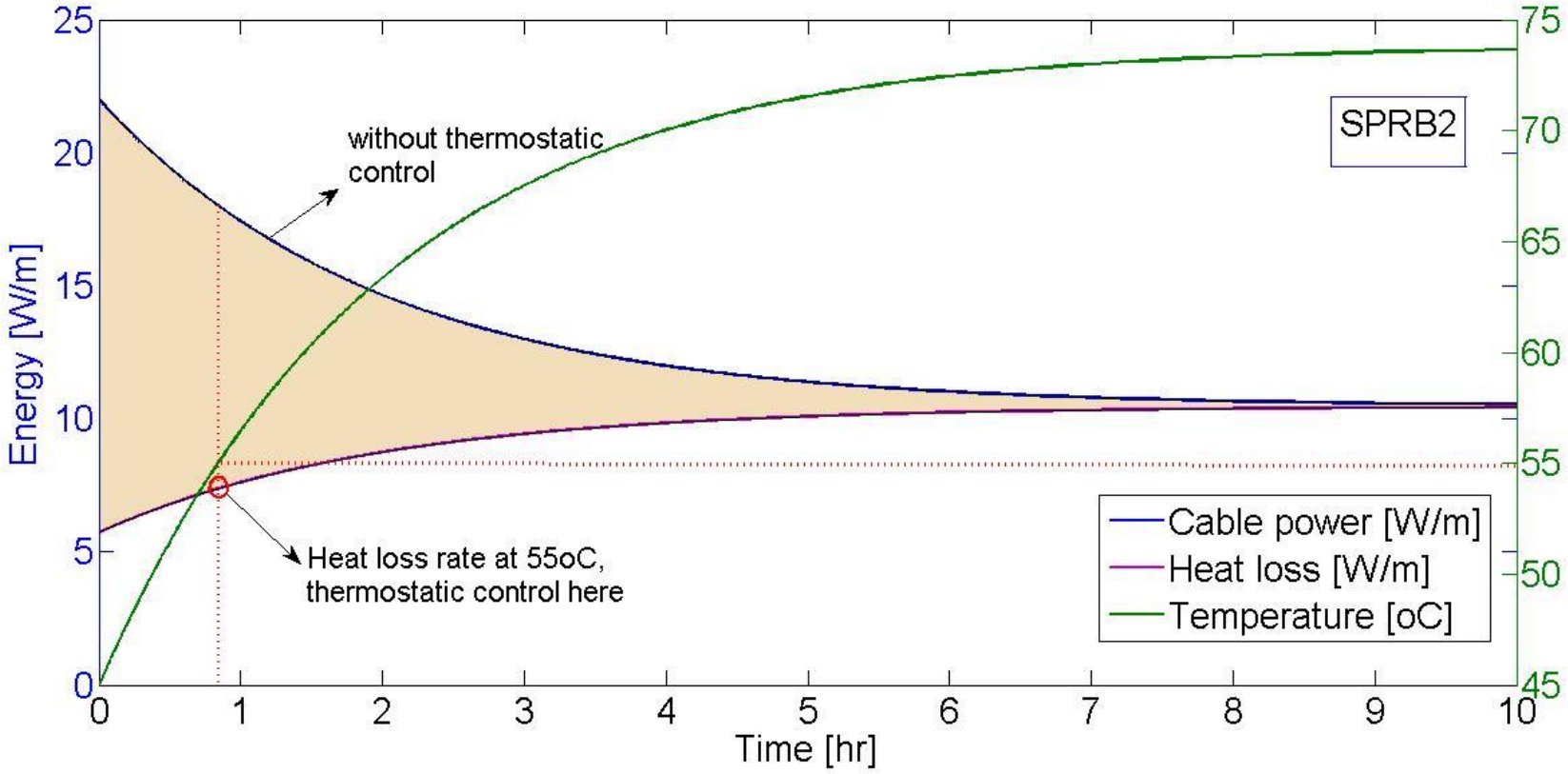
Simulation results



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Heat-up time for specific pipe segment

Heat-up time [hr]							
Cable R		Cable M					
Basement 1	Basement 2	Ground floor	1st floor	2nd floor	3rd floor	4th floor	5th floor
0.53	0.83	1.18	1.18	0.66	0.66	0.66	0.41

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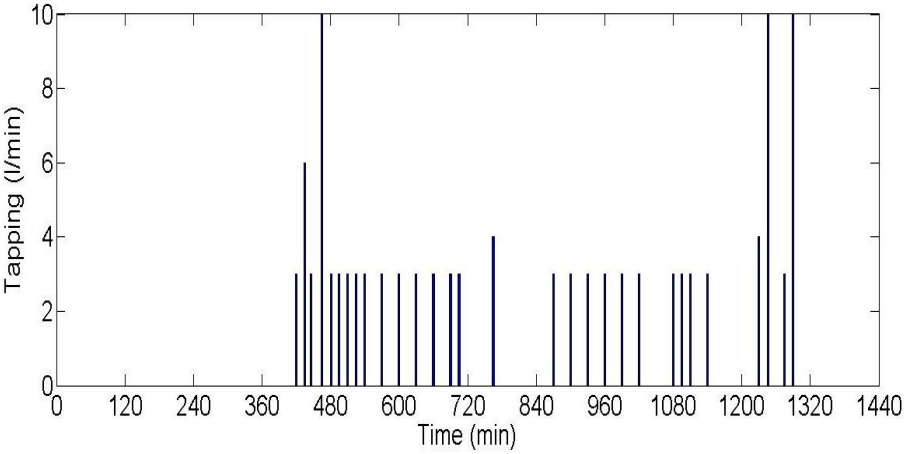
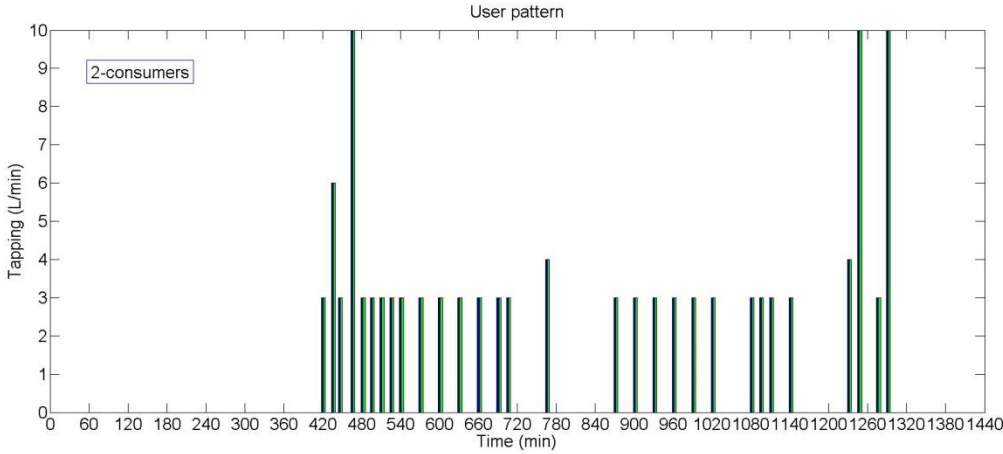
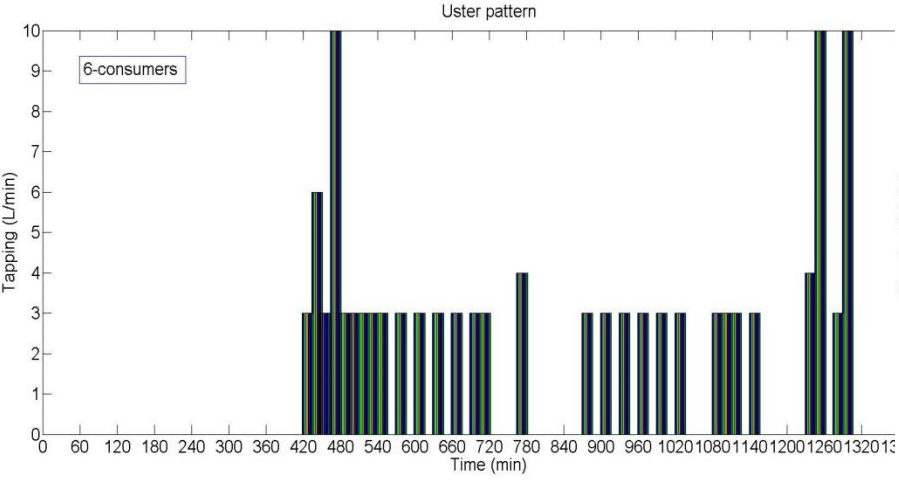
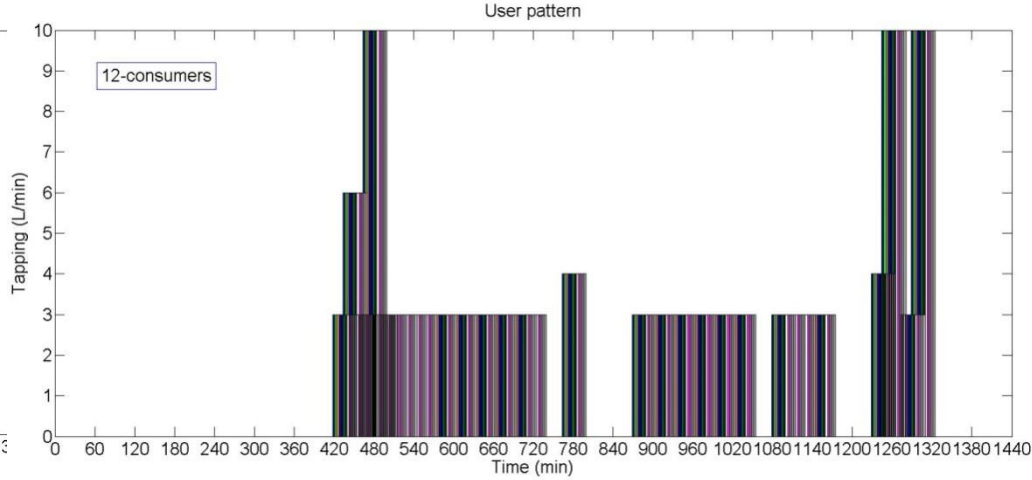
Different user profiles

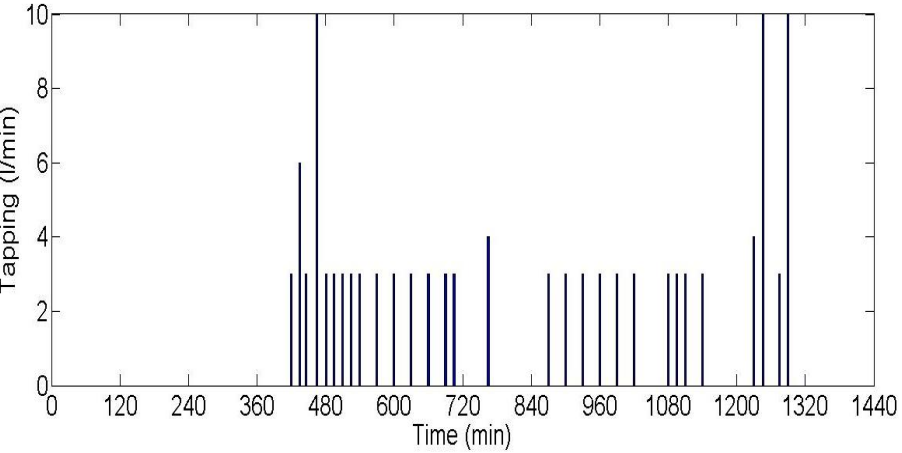




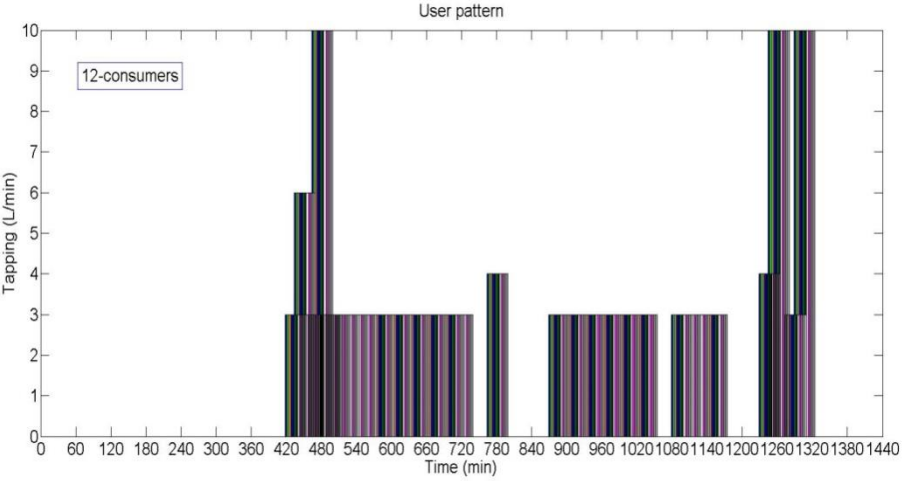




4 different scenarios

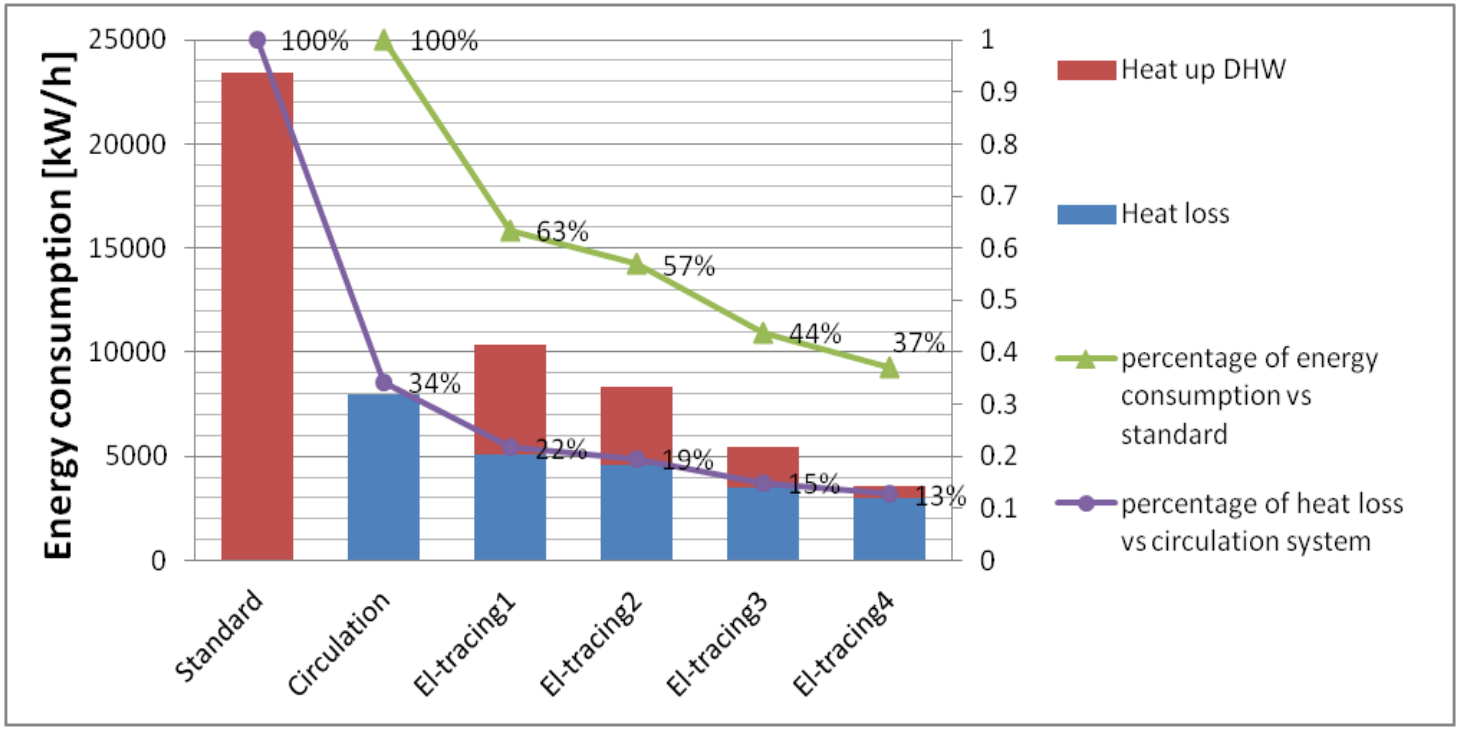


- All tapping happen simultaneously
- Heating cable using full power heating up DHW during each interval. Then switch to only cover the heat loss if has thermostatic control, or continue full power if no thermostatic control.



- Consumers use hot water in continuous order, no overlap
- Same logic for with/without thermostatic control.

Simulation results



Energy used for DHW according to standard is 23400kWh/year (13 kWh/m^2 annually) in this study.

El-tracing1-all consumers use DHW simultaneously, without t-control

El-tracing2-all consumers use DHW simultaneously, with t-control

El-tracing3-consumers use DHW one by one, without t-control

El-tracing4-consumers use DHW one by one, with t-control

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Summary

- Give possibility to the DH system to supply with low temperature at 50°C
- Safe supply without risk of legionella
- Save the expense of circulation loop
- El-tracing with thermostatic control can work with a small use of electrical energy
- User profiles has strong effects on the final energy performance – to be investigated in real case measurements
- To be compard with all the alternatives

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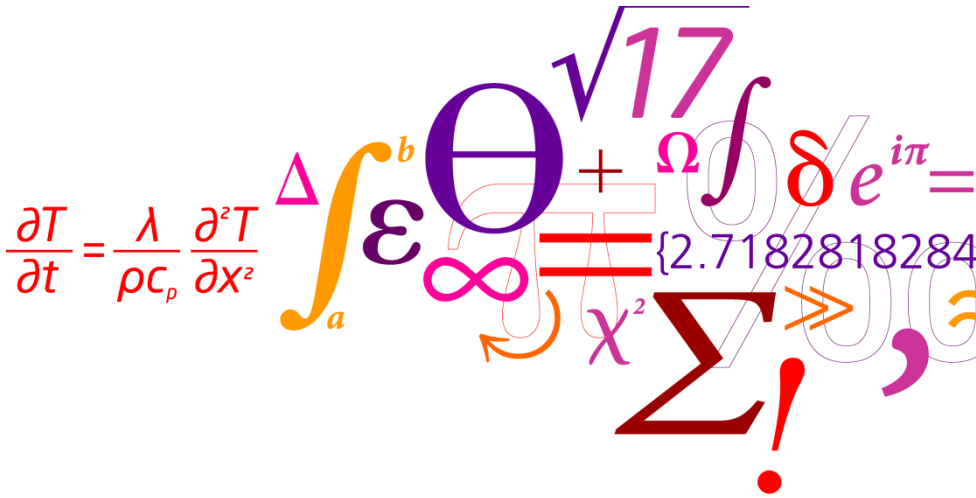
THANK YOU!



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