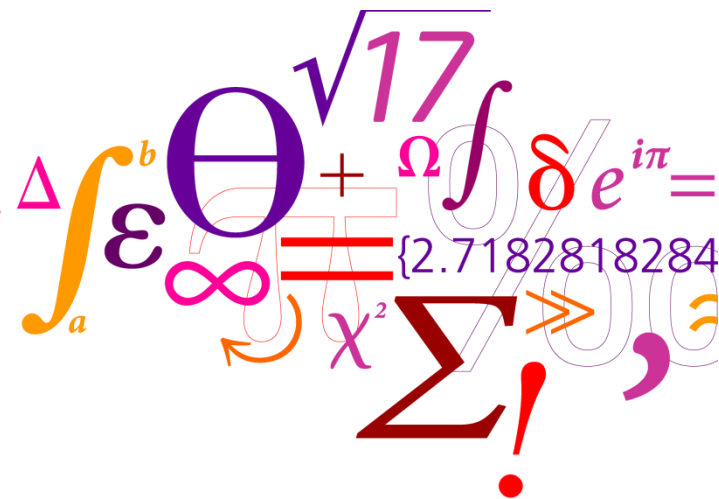# Supply of domestic hot water at comfort temperatures without legionella

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$$\frac{\partial T}{\partial t} = \frac{\lambda}{\rho c_p} \frac{\partial^2 T}{\partial x^2}$$

WP 1.2

- 1. Focus
  - ◦ The risk of legionella
  - ◦ Possible solutions
  - ◦ Analysis and investigations
- 2. Correlation with 4DH
- 3. Collaboration with industry and consultancy
- 4. Collaboration to other PhD projects in 4DH

Focus

Risk of Legionella bacteria

- Lead to fatal disease
- Commonly found in DHW system

Focus

Risk of Legionella bacteria

Important factors

- Temperature
  - 25-45°C seems to favour growth
  - System with 60°C (55°C at the faucet) has no risk of legionella

- Time
  - The time for legionella colonizing need to be measured considering both the pipework and storage tank.

Focus

Possible solutions

- S1. Keep the temperature of existing DHW system at 55-60 °C
  - Legionella will not survive above 60 °C
  - The temperature of LTDH will be lowered firstly to 65 °C.

Focus

Possible solutions

- S2. Instantaneous heater

Volume
(3 litres)

Supply temperature
(50°C)

- Effect on possible temperature of DH and DHW

Focus

Possible solutions

- S3-a. Thermal treatment

temperature	time
70°C	1 min
60°C	5 min
50°C	80 min

○ No additive into the hot water

○ Easy to realize
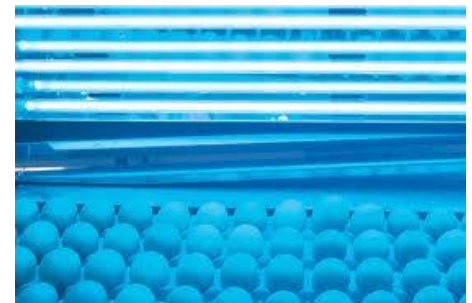
○ Consume more energy

Focus

Possible solutions

S3-b. UV sterilization

- Proved to be effective on the aquatic bacteria disinfection

- Price in respect to equipment installation and operation is more expensive

Focus

Possible solutions

- S3-c. Chemical treatment
  - Commonly used and cost-effective
  - Possible to disinfect all parts of the system by opening the outlets in the system
  - Usually carried out by chlorinating cold water
  - Proper amount of the dose

Focus

Analysis and investigations

- Which kind of solution has acceptable risk?
- Which kind of solution is more economical with respect to construction cost and operation cost?
- To what degree can the DH temperature be lowered according to each solution?
- What is the influence on the heat loss of the DH network and DHW circulation?

Correlation with 4DH

Provide knowledge on 4DH-DHW system

- Health
  - ◦ Eliminate the risk for human's life.
- Energy

  - ◦ Pay attention to ⎧ heat loss in the network

    Efficiency in the production procedure ⎭
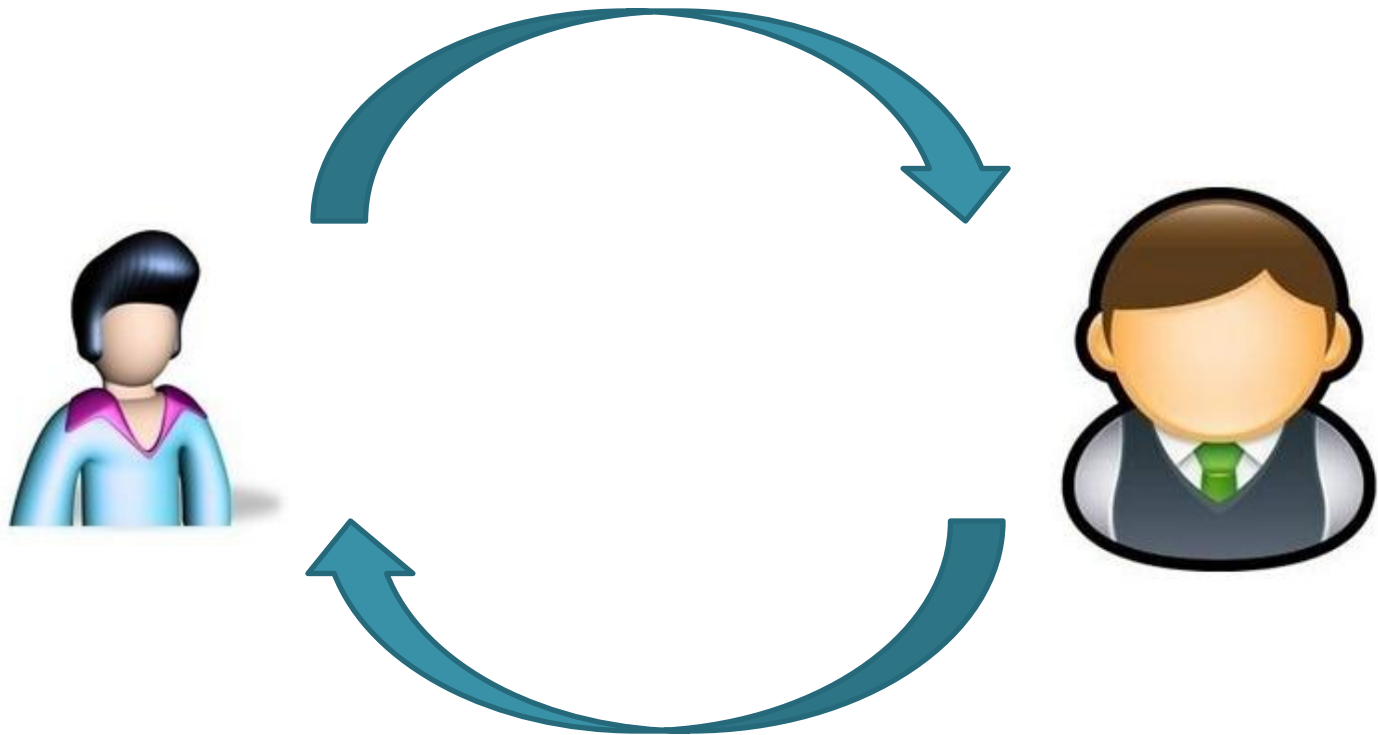
- Economy

Correlation with 4DH

Expected results next time

- Optimal solutions for 4DH-DHW system under different situations.
- Recommendation of operation and management methods to disinfect legionella bacteria.

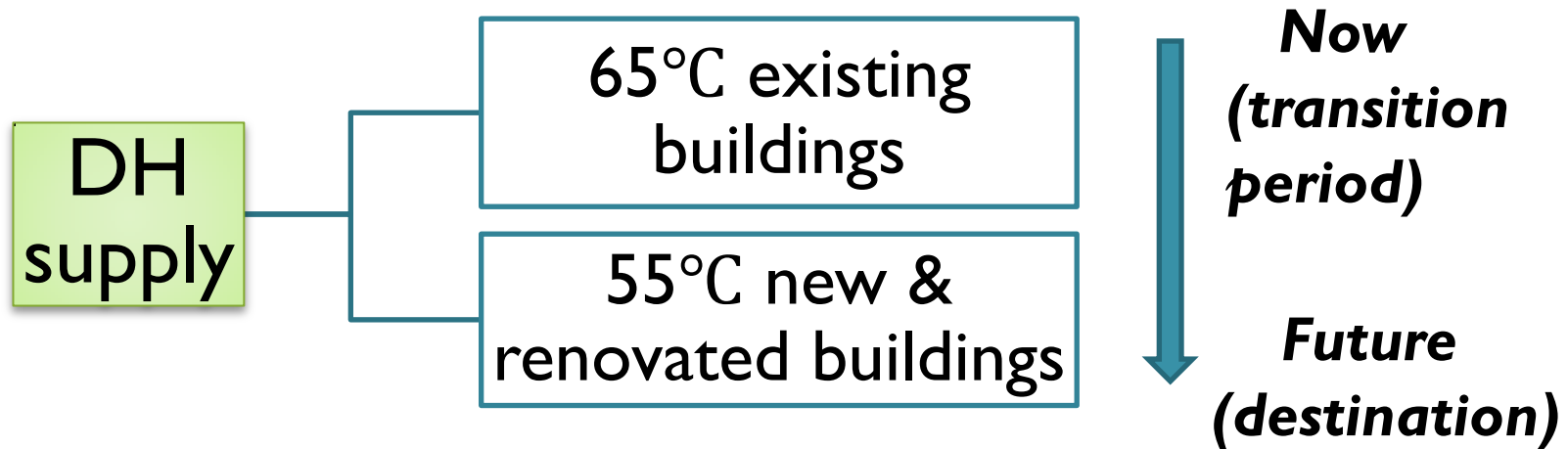# Collaboration with industry and consultancy

Proposal of promising solutions

Full scale test

Collaboration to other PhD projects in 4DH

- What we can collaborate?
  - Common studies of the scenario:

DH supply

65℃ existing buildings

55℃ new & renovated buildings

Now (transition period)

Future (destination)

Thank you!