




***Raychem***

# ENERGY-EFFICIENT HOT WATER TEMPERATURE MAINTENANCE SYSTEM

A SINGLE PIPE SYSTEM FOR GREATER  
ENERGY EFFICIENCY AND COST SAVING

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THEMAL BUILDING SOLUTIONS

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# MAKE THE RIGHT CHOICE IN HOT WATER SUPPLY SYSTEMS

To be ready for tomorrow's market, cost effective and environment-friendly solutions have to be found today.

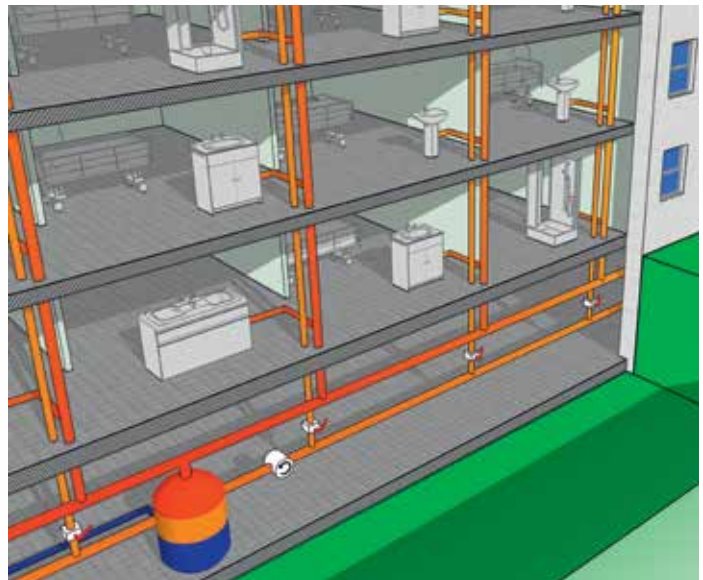
This has never been more vital than in hot water supply and distribution where energy consumption is a significant proportion of a buildings energy usage.

Hot water supply without wasting water or power is a requirement of any modern hot water system. At the same time, the system has to be run on economically and maintenance-free.

The Raychem HWAT single pipe system delivers these vital requirements.

## 1. THE CONVENTIONAL SOLUTION: THE RECIRCULATION SYSTEM

- Heat losses from the hot water distribution pipes are compensated for by the water heater
- A pump keeps the hot water circulating throughout the pipe network
- The hot water temperature in the pipe matches that in the water heater



### Requirements for hot water systems



**HYGIENE & COMFORT**



**FLEXIBILITY**

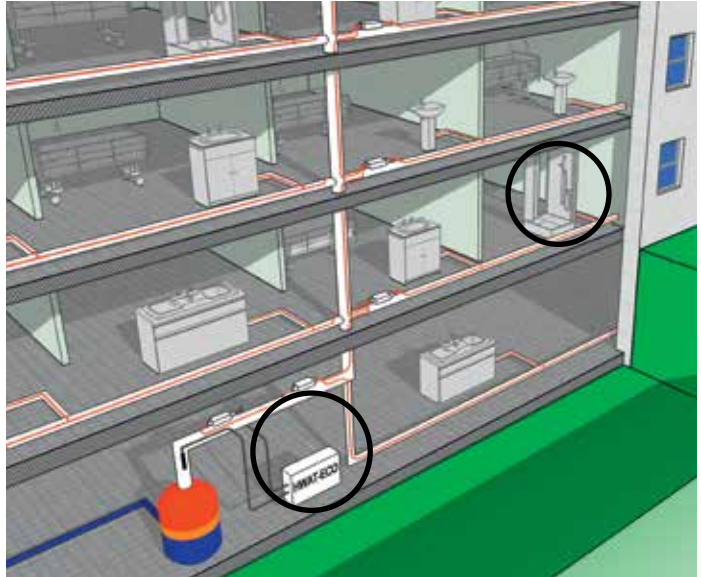


**ECONOMY**  
water & energy



## 2. THE ALTERNATIVE: THE HWAT SINGLE PIPE SYSTEM - INGENIUS THROUGH ITS SIMPLICITY!

- A heating cable attached to the single hot water pipe keeps water at the desired temperature
- Any heat losses from the hot water pipes are compensated for by a self-regulating temperature maintenance cable attached to the individual hot water pipes. As a result, the individual pipe temperature can be selected, up to that of the storage tank temperature.
- The temperature of the cable adjusts at any point along the pipe dependent upon the local conditions on the pipe network. This means that the pipe is heated everywhere in proportion to how much it cools down. If hot water is flowing, the thermal output is reduced. The more often the hot water tap is turned on, the less the hot water temperature maintenance system needs to be activated.
- The easily-programmable temperature control device HWAT-ECO monitors the boiler temperature and ensures that the system is used exclusively for maintaining the temperature in the pipe network, not for heating the water. In this way, power consumption is reduced to a minimum.



### HOW DOES IT WORK?

The key components of the intelligent hot water temperature maintenance system:

1



#### The cable compensates for the heat loss

The self-regulating heating cable compensates for the heat losses and keeps the temperature at the required level.

2



#### Insulation reduces the heat loss

Pipes must be insulated with the correct thermal insulation to maintain the desired pipe temperatures.

A good thermal insulation means:

- Lower heat losses
- Lower operating costs

**Economical warm water supply requires good insulation, whether recirculation or single pipe systems!**

3



#### The controller for economical operation

Programming the temperature control device HWAT-ECO is very easy, thanks to the building-specific software.

4



#### Smart Connection

Connections are fast and easy with the Rayclic connection system.

# A HYGIENIC AND COMFORTABLE SYSTEM

## HYGIENE & COMFORT

The requirements placed on hot water temperature maintenance systems concentrate on the comfort of the user...

Edi Meier, the Technical Director of the Adelheid Hospital in Unterägeri/Switzerland, says:

"In our hospital, we treat our patients as customers. Waiting too long for hot water means less customer satisfaction."

... and on that of the operator (the hospital),

"With the Raychem single-pipe system, there is no maintenance, there are fewer pipes and no control valves or pumps present. The system has been used reliably and with great efficiency for 10 years in our hospital."



**Hygiene requirements in hospitals: The Raychem system fully satisfies the requirements of the Department of Health - Health Technical Memorandum 04-01: The control of legionella hygiene, "safe" hot water, cold water and drinking water systems**

- **Shortest pipe network of all central hot water temperature maintenance system** (½ pipe length, so no return pipes)
- **Guaranteed high temperature (>55°C) throughout the system, over its entire length**
  - No unheated zones
- **Small mixing zone in the storage tank**
  - No runback into the storage tank
  - Possible as far as the tapping point
  - Temperature of up to 70°C can be selected at any time
- **Renewal of water in the pipe network**
  - Pipe volume is 100% renewed with each tapping

Result: As a result of the hot water single-pipe system having fewer pipes, less water volume and less heat loss, the danger of any bacteriological problems is significantly lower.

Edi Meier, Adelheid Hospital:  
"Whenever the annual water inspection has been carried out by the hygiene inspectorate, no critical legionella levels have ever been exceeded, even without any preventative measures!"

# FURTHERMORE, A FLEXIBLE SYSTEM!

## FLEXIBILITY

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### **The hot water temperature maintenance system: a flexible and space-saving system**

- The space requirement for pipes has been reduced, because no return pipe is present. Risers, shafts and openings can be minimised freeing space for other services
- An existing building may have an extra storey or an extension added. The new part of the building can be connected to the hot water temperature maintenance system easily, rapidly and economically, without needing any hydraulic compensation
- The existing recirculation system can be easily upgraded in sections, where appropriate
- It is possible to let rooms or storeys to third parties without any problems, as separate cost invoicing can be provided for hot water usage

## LOW INVESTMENT COSTS

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### **The system requires only a few components**

- There are no pumps, control valves or double water meters, and the temperature maintenance cable is fitted directly to the hot water pipe under the thermal insulation
- Time-consuming installations of return pipes are unnecessary

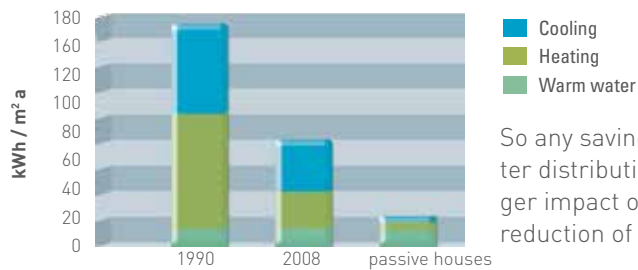




# TO BEHAVE "ECONOMICALLY" MEANS:

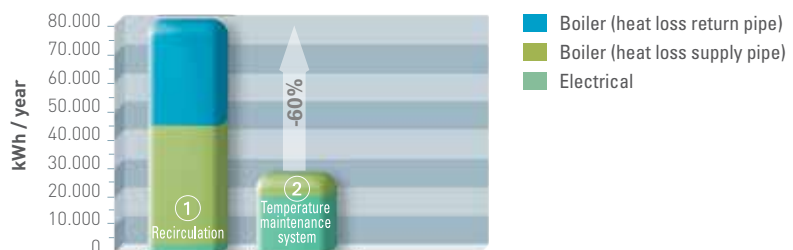
## ECONOMY: SAVE ENERGY!

Architects and building engineers are obliged by current building regulations to actively seek opportunities to reduce energy or to use renewable energies. In recent years, a big focus has been on reducing energy for heating and cooling. This activity has meant the energy needed for sanitary warm water production now takes up a bigger portion in the energy needs of a building.



So any saving on the warm water distribution will have a bigger impact on the total energy reduction of the building.

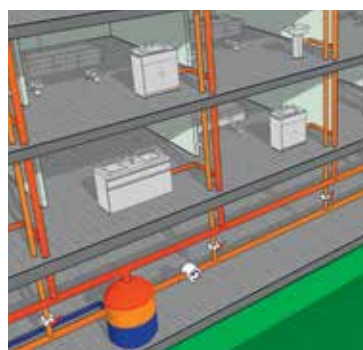
With the Raychem single pipe system, the energy spent on warm water distribution can be reduced by 60% compared to the energy which a recirculation system needs. The Raychem system can bring a significant CO2 reduction if the electricity for powering the system utilises ecological energy sources, such as photovoltaics, combined heat and power (CHP), and other non-grid supplied sources.



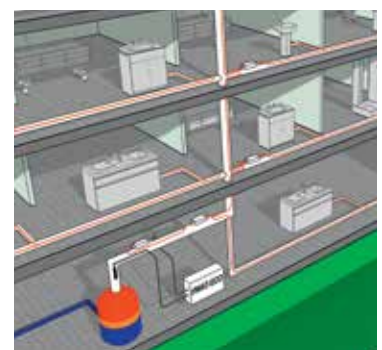
### The 60% energy reduction is realised by:

#### 1. Less heat loss due to one pipe

The single pipe system has only 1 flow pipe so the heat loss of the return pipe falls away. The single pipe system needs no recirculation pump, so no electricity needed for the pump. Additionally, there are no mechanical parts, so maintenance cost is negligible.



Traditional recirculation system

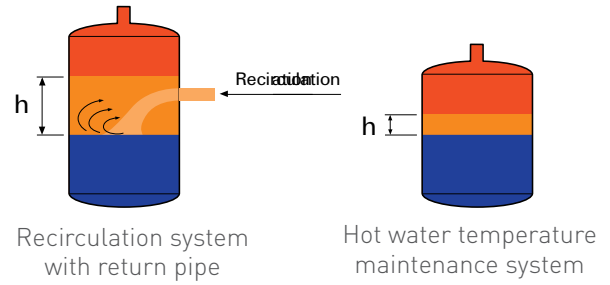


Single-Pipe-System

# PLANNING FOR TODAY AND TOMORROW!

## 2. More efficient use of the boiler

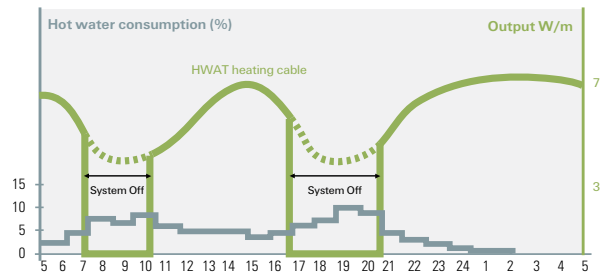
A smaller boiler can be selected because of the reduced water volume in the pipes (no return pipes). The boiler functions more efficiently because there is no return pipe to the boiler (continuous build up of heating layers).



## 3. The HWAT system can be switched off during tap times

During times of heavy water consumption, the warm water from the boiler flows through the pipes

- An intelligent control device HWAT-ECO saves energy by shutting down the system during these tap times
- Also during nights with little or no water consumption, the maintenance temperature can be lowered



## 4. The heat loss is compensated with greater efficiency

- In a recirculation system, the heat loss is compensated by the warm water coming from the boiler. During the warm water production process and during the flow in the pipes, extra heat losses are generated (efficiency of boiler, chimney, etc). The total produced energy is higher than that required in the piping network.
- In the single pipe system, the self-regulating cable is attached to the pipe. It senses at each point the need for heat. The energy is exchanged exactly where it is needed and this alongside the total length of the pipework. No efficiency losses.

### Heat loss recirculation



- Heat loss and efficiency charging circuit
- Heat loss chimney
- Heat loss boiler

### Electricity

### Heat loss single Pipe, HWAT-System



9 W/m

8 W/m

heat loss flow pipe

heat loss return pipe

## 5. The single pipe system has a positive impact on the efficiency for cooling a building

- In commercial buildings, a lot of energy is used for cooling the building. It would be more efficient to prevent the heating up of a building in order to reduce the need for cooling.
- The single pipe system eliminates the heat from the complete return pipework from the warm water distribution, thus reducing the energy bill for cooling.

# A PROVEN TRACK RECORD – CASE STUDIES

Energy consumption case studies, performed in real conditions. HWAT and recirculation system run in parallel in same ambient and operational (tap times) conditions.

## UNIVERSITY OF BATH (UK) – SPORTS PAVILION:

**54% of energy saved for warm water distribution**

### System description

- Taps:
  - 34 shower draw off points
  - 17 hand basins
  - Launderette
- System:
  - 150 m of galvanised steel pipes (140 m return pipework)
  - Fibre glass insulation with thickness similar to the diameter of the pipe
  - Water maintain temperature 50°C



### Results yearly energy usage

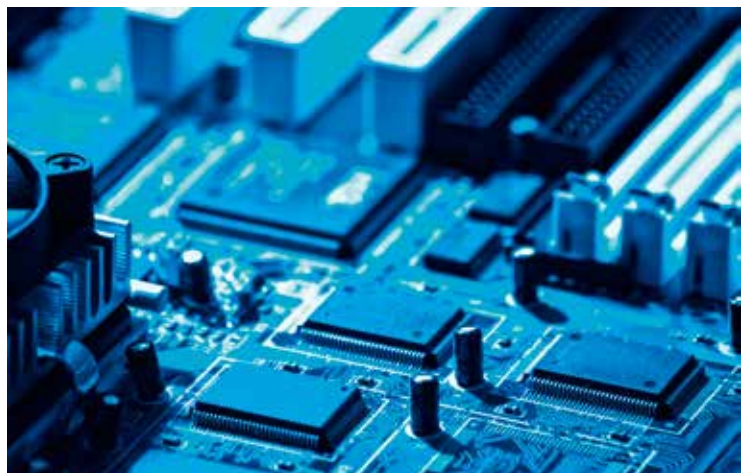
- Recirculation: 45 522 kWh
  - HWAT one-pipe: 20 826 kWh
- } 54 % energy saving\*

## JYDSK TECHNOLOGISK INSTITUT (DK) – UNIVERSITY:

**48% of energy saved for warm water distribution**

### System description

- System
  - Lab set-up with one draw off point
  - 33 m of galvanised steel pipes with diameter of 32 mm
  - Mineral wool insulation with thickness of 40mm
  - Water maintain temperature 55°C



### Weekly energy usage

- Recirculation: 921 W
  - HWAT one-pipe: 480 W
- } 48 % energy saving\*

\* Further optimisation through the use of the HWAT-ECO controller can be achieved



# HAVE YOUR NEXT PROJECT CALCULATED AND COMPARED!

## Raychem provides free calculations to benchmark energy consumption and lifetime costs

The SaveWatt calculation and design software compares the effectiveness of a hot water temperature maintenance system with that of a circulation system.

Comparison of:

- Investment costs
- Energy consumption
- Operating costs
- Amortisation (Lifetime cost)

The program contains modules with which the optimum temperature settings can be calculated. The software also creates a bill of materials for the project.

### SAVEWATT COMPARISON BETWEEN A SINGLE PIPE SYSTEM AND RECIRCULATION

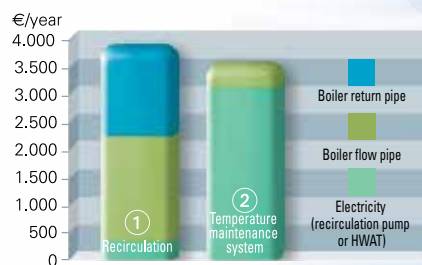
Example, using a real calculation in a hospital equipped with recirculation (flow pipe 370 m)

#### 1. Investment costs



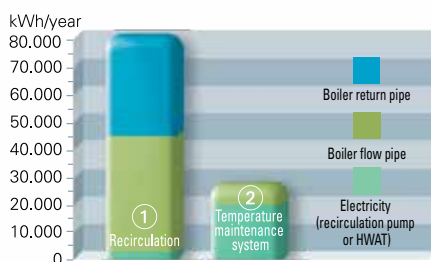
Investment costs:  
13% less than in a circulation system

#### 3. Operating costs



Operating costs:  
10% lower operating costs

#### 2. Energy demand



Only 36% energy demand

#### 4. Depreciation

(period of use 20 years, rate of interest 5%)



Depreciation: 10% saving of the capital and operating costs per annum

# ECONOMICAL & ECOLOGICAL: SAVING WATER MEANS SAVING ENERGY!

## ECONOMY: SAVE WATER!

There's no questioning the vast impact that warm water supply has on the environment.

5,5 % of our total energy needs flows into warm water generation and this will increase during the coming years.

In addition to energy, buildings consume an astounding amount of water that can harm the larger environment. With such a staggering environmental impact, it stands to reason that water distribution systems are poised to become a big target for consumption-saving initiatives.



The HWAT single pipe system guarantees warm water comfort straight to the tap. The Raychem self-regulating heating cable is installed in a straight line on each piping material, (metal or plastic) and each pipe size. No more water needs to be wasted whilst waiting for warm water, which has a big impact on the environment and user's water costs.

### Example for water waste

#### Hotel with 200 rooms

3	metres of pipe of DN25 without recirculation or heat tracing
x 1,5	litres of waste water at each tap
x 5	taps per day for each room
= 45000	litres per month "warm" waste water

With a single pipe system, traced to the tap point, a 200-room hotel saves enough water to fill the average swimming pool every month!



# HOT WATER TEMPERATURE MAINTENANCE SYSTEM

## ECONOMICAL & ECOLOGICAL FROM THE GROUND UP!

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### 1. A system which allows the efficient use of water

No water wastage caused by lengthy cold tapping

### 2. An energy-friendly and cost saving system

- The system **saves as much as 60% on power in comparison with the recirculation system**
- No return pipe, so lower heat loss from only one pipe

### 3. A hygienic system

### 4. A system with no maintenance costs

- No recirculation pump – no parts to wear out
- Fewer pipes, no control valves or pumps
- No hydraulic compensation







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