

*Protect your asset investment:  
Avoid corrosion using correct water treatment*



*Steam blow at Tilbury Green Power  
Waste Wood Biomass Plant UK*



*Chemical free make-up water*

# Water treatment for district heating and heat & power plants

# Introducing EUROWATER group

Focus on District Heating



## International profile

EUROWATER is a leading, independent Danish manufacturer of water treatment solutions with approx. 400 employees throughout Europe. We have manufactured solutions for district heating and energy companies for decades: Boiler heating plants, combined heat & power plants, waste-to-energy plants as well as solar heating plants. Besides installations in Denmark also in Sweden, Finland, Germany, The Baltic Countries, Norway, Poland, Austria, The Netherlands, France, Switzerland, Ukraine etc. – markets where we have own sales and service teams.

## Reliable water treatment solutions

Being able to handle hot water- as well as steam applications gives us the ability to handle most water treatment matters in such plants and their piping infrastructure for district heating. Our long experience means we can design water treatment solutions that incorporate opportunities for water and energy savings, minimum use of chemicals, minimum floor space footprint for the plant, trouble-free installation and operation, fast, safe and reliable commissioning of plants with a long life cycle.

## Danish integrity

The location of our HQ and factories in Denmark has inspired us to focus on innovative technology solutions

complying with the strict demands into the modern district heating market in Denmark.



*The Danish District Heating Association has published recommendations for correct water treatment and corrosion prevention.*

## Official recommendations

Recently, the Danish District Heating Association (representing almost 400 district heating companies in Denmark) published its recommendations for correct water treatment with focus on preventing corrosion of pipes etc. – which could cause water leakages (loss of water and energy), intake of untreated water through the network as well as interruption of supply to the customers of the district heating company.

Water treatment influence lifecycles and maintenance requirements for key assets such as pipes, boilers, heat exchangers etc. So the recommendations emphasize asset management.



*EUROWATER specializes in high quality chemical free water treatment solutions with a long life expectancy.*

## Chemical free investment

Chemicals have historically been added to try to help a problem of more fundamental character with inadequate water chemistry. Danish District Heating Association recommends to avoid the use of chemicals. Chemicals are expensive so investments in new technology to remove oxygen without chemicals represents a short return of investment. EUROWATER manufactures the water treatment solutions matching these criterias.



# District Heating in Denmark

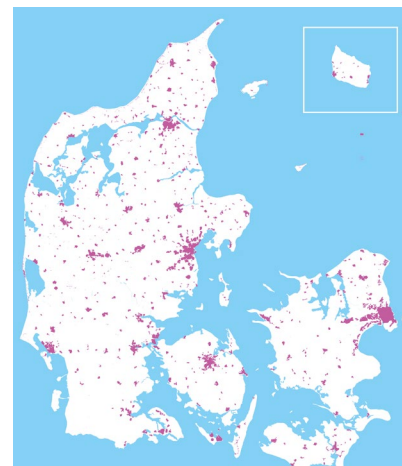
A Global Competence Center for this Industry

Denmark is considered the leading district heating market regarding innovation and practical experience with modern district heating. 64 % of Danish households enjoy the benefits of being connected to environmentally clean and energy efficient DH systems. The DH systems utilizes the heat from a wide variety of energy sources such as combined heat and power plants, waste-to-energy plants, boiler heating plants, surplus heat from the industry, solar thermal systems as well as geothermal heat and large-scale heat

pumps. This flexible system configuration (different heat sources) ensures an optimal and reliable energy supply, increases efficiency and reduces fuel costs.

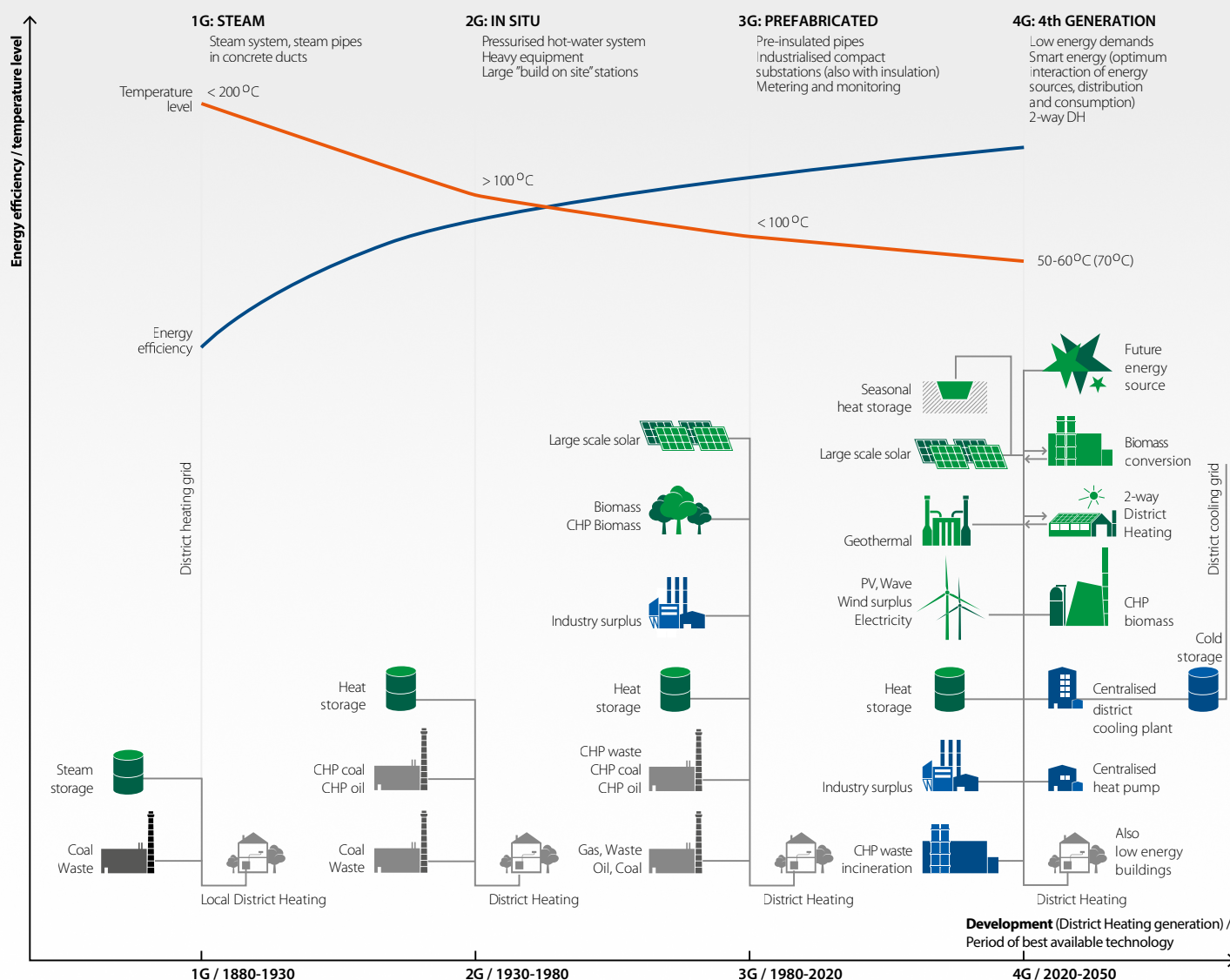
Today DH in Denmark is mostly powered by non-fossil energy sources.

The innovative approach in Denmark has i.e. led to the research project 4th Generation District Heating (i.e. based on low temperature heat), which attracts world-wide attention.



■ Distribution of district heating in DK.  
More than 64% of households are connected.

*The generations of district heating technologies since inception. The 4th generation operates with much lower temperature and significantly increased energy efficiency. (Source: Danfoss)*



# Water treatment for district heating and heat & power plants

The EU, as well as many other countries, have put district heating on the agenda with their climate goals. Proper water treatment is a precondition of optimum return on investment, since correct water quality is essential for optimizing the life cycle of pipes, boilers and heat exchangers.

## Total cost of ownership (TCO)

SILHORKO-EUROWATER was selected by a leading district heating company because the solution could provide the lowest total cost of ownership (TCO) over a period of 15 years.

The best assessment of a comprehensive solution is based on total cost of ownership, not on lowest possible purchase price only.

► [www.eurowater.com/105900](http://www.eurowater.com/105900)



## Green conversion

District heating is an important part of the energy sector's future. In line with technological advances, energy production can be transformed into more green and sustainable energy – without changing the distribution network. This has among other things contributed to the central role that district heating now plays in the climate objectives of the EU.



## Denmark as a front runner

The first district heating installation was back in 1903. Today, more than 64 % of Danish homes are heated by district heating. Especially during the last 50 years, extensive knowledge and experience in efficient operation has been accumulated, placing Denmark among the top pioneers in district heating technologies.

With headquarter and factories in Denmark, SILHORKO-EUROWATER has for many decades been actively involved in the development of this market as a supplier of modern and innovative water technology.

## Sustainable district heating



## Supply security

Water treatment for one of the largest gas-fired CHPs in Poland. This project is part of the country's efforts to reduce its dependence on coal for electricity production.

The plant consists of three independent production lines, each producing 25 m<sup>3</sup>/h.

The water is used as boiler make-up water and the solution comprises double-pass reverse osmosis systems and EDI.

► [www.eurowater.com/109980](http://www.eurowater.com/109980)

### Water on the agenda!

Security of supply, green conversion, sustainability, and major investments are headlining the energy sector's agenda of hot topics. Asset management is a key parameter to ensure good bottom line economy. Proper water treatment is a precondition for ensuring the maximum life cycle of important components such as transmission and distribution pipe systems, boilers and heat exchangers.

Hot water is used for heating our homes. In the form of steam, water is the driving force of a turbine for electricity production. District heating water, however, is not just heated water. Make-up water for steam boilers is also not just water. The water quality and how the water quality is produced are of great importance.

Therefore, water must be on the agenda!

### Save water and energy

SILHORKO-EUROWATER focuses on developing products that minimize water waste and energy consumption. This is perfectly in line with the district heating industry's green conversion. Over the last 25 years, Danish district heating production has increased by almost 50 % while total CO<sub>2</sub> emissions have decreased.



### Chemical free and environmentally friendly

The photo shows a chemical free solution for the production of boiler make-up water for a CHP plant. By utilizing new technology, chemicals can largely be avoided for the benefit of operating costs and health & safety factors in plants. An important factor to mention in your green accounts.

▶ [www.eurowater.com/095103](http://www.eurowater.com/095103)



### Protect your investment

If the water is treated correctly, boilers, valves, fittings, installations, and underground piping can last for many years. Great values are at stake; in Denmark alone 60,000 km of district heating pipes must currently be protected against corrosion.

### Solar heat

Solar heating systems are one of the emerging energy source technologies. We have been involved in several large solar heating systems in which the water treatment project has typically been to fill the thermal energy accumulator with treated water.



## Optimum solution

The right choice of water treatment solution depends on many conditions. SILHORKO-EUROWATER can contribute with thorough knowledge of water treatment technology as well as operation and service of plants, from small to large. As developer and manufacturer of our own products, we have solid experience of long-term operation as well as maintenance.



*CU:RO is a complete compact unit for producing demineralized water and comes in a series of flow configurations ranging from 0.4 to 2.0 m<sup>3</sup>/h.*

### Valued supplier and preferred partner

Our vision is to be a valued supplier of intelligent and reliable water treatment solutions as well as the preferred partner for energy supply customers requiring optimum and long-term solutions.

### District heating know-how

As manufacturer and supplier of water treatment plants for the energy sector for decades, we have accumulated considerable knowledge and experience in this field. The number of solutions delivered within applications such as make-up water, circuit water, and boiler water can be counted by the thousands.

We provide water treatment solutions that ensure a daily supply of the required water quality in the right volumes.

In other words, SILHORKO-EUROWATER has extensive knowledge about water. Use it. Contact us today! Our experts are spread across Europe at our own sales- and service companies – so we are always near you and our installations.



# Water treatment for district heating

Water quality is crucial for the durability of district heating pipes, installations, and boilers. Softening, demineralization, and deaeration are the keys to trouble-free operation.

## Optimum water treatment

The main goal of water treatment is to prevent corrosion, deposits, and pipe fractures – in short, to extend the life of the plant. Pipe fractures cause interruptions of supply to customers as well as loss of valuable water. Furthermore, through fractured pipes raw, untreated water can intrude and pollute the treated water in the distribution network.

Optimum make-up water and circuit water must therefore be demineralized, deaerated (oxygen), free of mechanical impurities, and pH-adjusted.

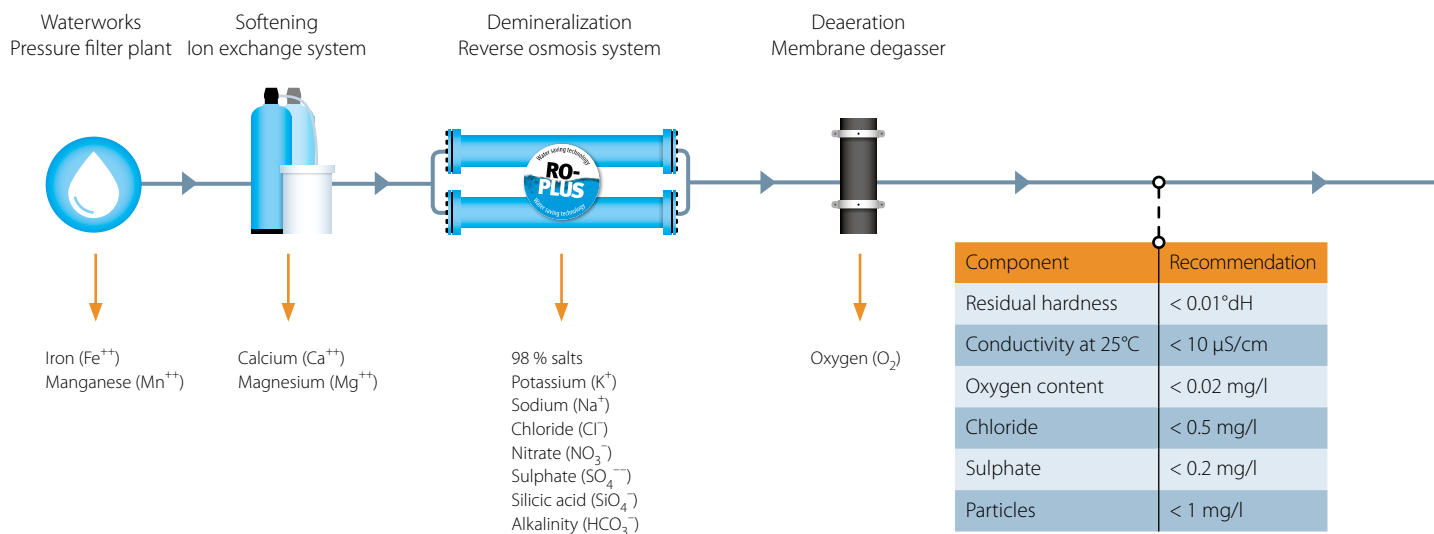
Typically, the optimum water treatment solution for preparing make-up water comprises the following steps:

- Reduction of iron and manganese content in a pressure filter, provided that the inlet water is not of drinking water quality.
- Demineralization in a reverse osmosis system, pre-treated in a softening plant.
- Removal of oxygen using a membrane degasser or a vacuum deaerator.
- pH-adjustment.

## Download recommendations free

In order to share useful knowledge to people working with district heating water treatment outside of Denmark, SILHORKO-EUROWATER has translated the official recommendations published by the Danish District Heating Association. They are available, free of charge, on our website.

## Make-up water



Recommendations for demineralized make-up water (source: The Danish District Heating Association)

Complete plant with softening, reverse osmosis and membrane degassing for producing make-up water. Watch a short film (3 min.) about the solution installed at a district heating company. ► [www.eurowater.com/shf](http://www.eurowater.com/shf)

Vacuum deaerator for removing dissolved gases. Made of stainless steel in our own factory.





### Facts about corrosion

Oxygen, salts and particles in the water are all causes of corrosion. The oxygen reacts with the steel in the district heating pipes while the salts act as catalyst for the electrochemical corrosion. If the corrosion is kept active, leaks will eventually develop that can be both difficult to detect and expensive to repair. By removing salts and oxygen as well as adjusting the pH, the basis for corrosion – including microbial corrosion – will be removed.

### Partial stream filtration

Raw water intrusion, corrosion products, and suspended magnetite will inevitably occur in the district heating circuit, causing problems in the closed system. By filtering a partial stream of 5-10 % of the total flow, it is possible to reduce this pollution considerably and to avoid breakdowns.

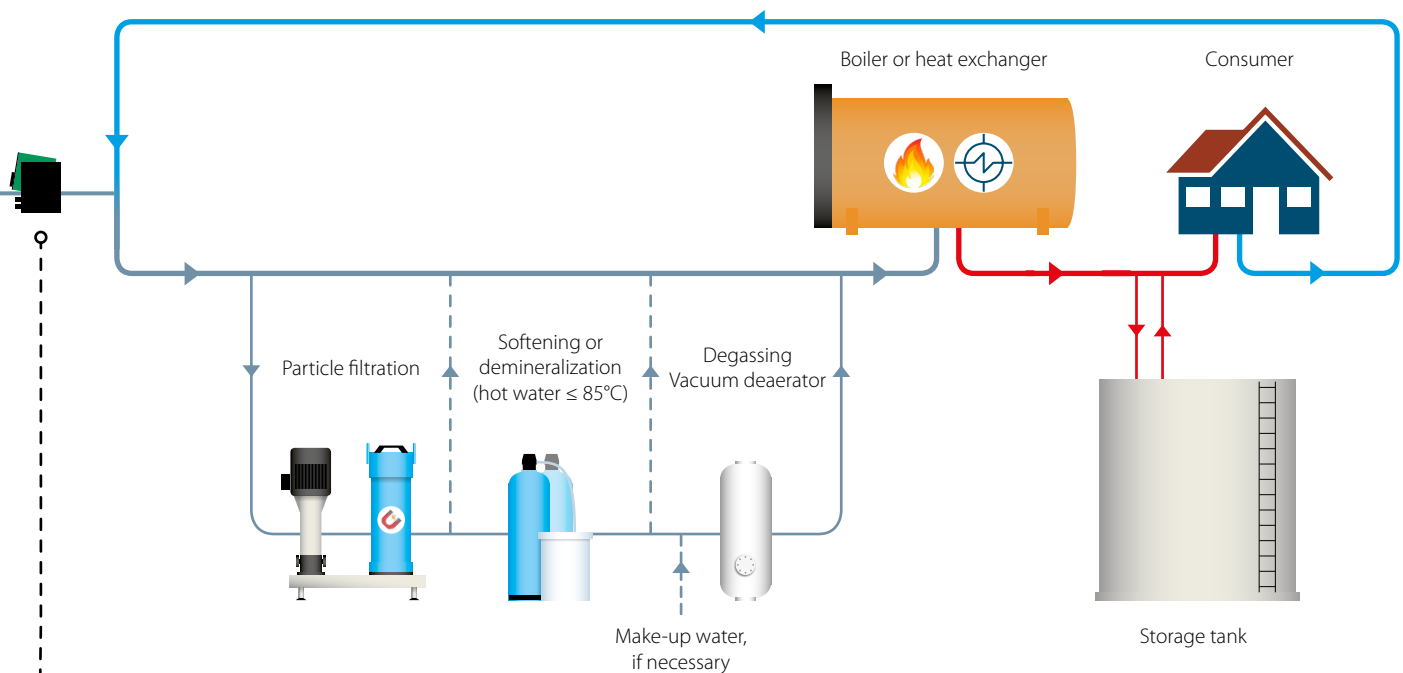
As a minimum, particle filtration with bag filter and magnetic insert is recommended. If raw water intrusion causes an increase in hardness, softening should also be applied. The return water, which is filtered in a partial stream, is typically 35-40°C and therefore requires special consideration. SILHORKO-EUROWATER has a special series of softeners capable of treating water with temperatures up to 85°C.

In some cases, the raw water penetration is so extensive that a comprehensive solution is necessary to filter, soften, and degas a partial stream. A water analysis and a calculation can determine whether or not this is required.



A magnetic insert in the particle filter efficiently collects magnetite residue from the circuit water.

## Circuit water



### pH-adjustment and corrosion prevention

Circulating district heating water should have a pH-value of 9.8 ( $\pm 0.2$ ), as this ensures a stable, corrosion-proof magnetite coating on the inside of the district heating pipes. The pH is adjusted through dosing of NaOH.

pH 9,8  $\pm 0,2$



# Combined Heat & Power (CHP) Plants

## A short introduction to CHP

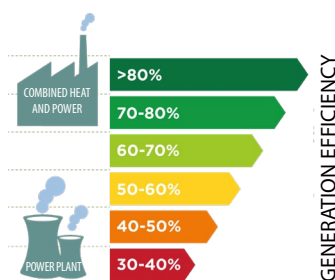
Also known as cogeneration – CHP is a way to increase the efficiency of power plants.

Cogeneration is a thermodynamically efficient use of fuel. In separate production of electricity, some energy must be discarded as waste heat, but in cogeneration some of this thermal energy is put to use. All thermal power plants emit heat during electricity generation, which can be released into the natural environment through cooling towers, flue gas, or by other means. In contrast, CHP captures some or all of the by-product for heating, as hot water for district heating.

CHP is therefore one of the most cost-efficient methods of reducing carbon

emissions from heating systems and is recognized to be the most energy efficient method of transforming energy from fuels into electric power and (district) heating.

Waste-to-Energy (WtE) or Energy-from-Waste (EfW) is the process of generating energy in the form of steam, electricity



and/or heat from the incineration of household and similar waste.

Energy recovery from waste is a very good idea environmentally and financially:

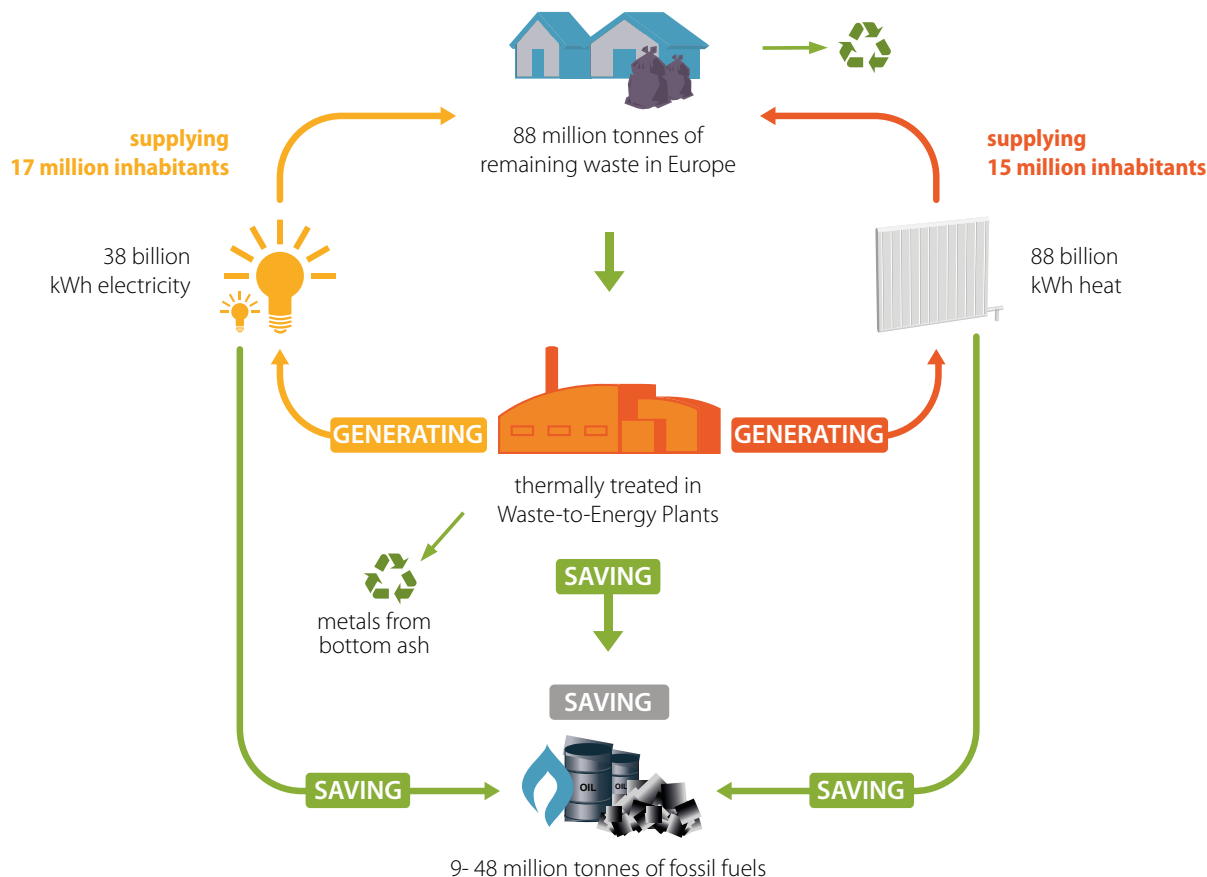
1 ton of waste can be converted to 2 MWh heat and 0,7 MWh electricity.

Waste represents a local, cost effective, secure and sustainable energy that is already used in some District Heating networks, allowing them to deliver affordable energy and reducing primary energy consumption.

EUROWATER have extensive experience in supplying water treatment solutions for both CHP- and WtE-Plants. See next pages for more info

# Waste-to-Energy Plants

A reliable and secure source of energy



The 88 million tonnes of household and similar waste that remains after waste prevention, reuse and recycling, was treated in Waste-to-Energy Plants across Europe in 2014, generating 38 billion kWh of electricity and 88 billion kWh of heat. Between 9 - 48 million tonnes of fossil fuels can be substituted annually, emitting 24 - 48 million tonnes of CO<sub>2</sub>. Replacing these fossil fuels, **Waste-to-Energy Plants can annually supply about 17 million inhabitants with electricity and 15 million inhabitants with heat** throughout the year. (Source: CEWEP)



# Water treatment for heat & power plants

Boilers and turbines for heat and electricity production are highly sensitive to dissolved salts and particles in the water. Removal of these elements is essential for operation, service life, and security of supply.

## Optimum make-up water for high-pressure boilers

The main purposes of water treatment for steam boilers are to reduce corrosion and wear of the boiler, to protect the turbine, to minimize blowdown, and to reduce consumption of chemicals as much as possible.

This is exactly why the composition of the water treatment directly influences the supply security of the boiler plant. An optimum water treatment ensures trouble-free operation with optimum economy.

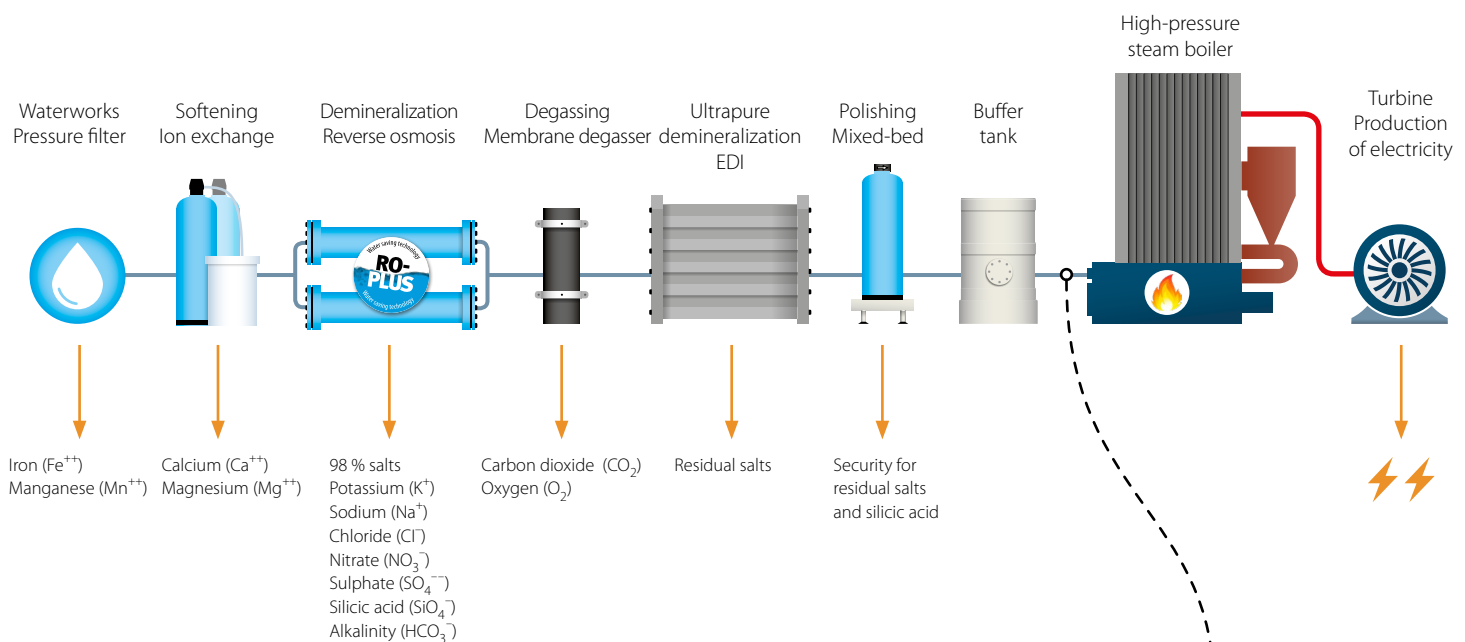
As a minimum, the water treatment must meet the regulatory requirements. At the same time, it must also meet the boiler supplier's specifications. This is often a precondition of the supplier's ability to comply with guarantee obligations.

## Individual preconditions

For decades, SILHORKO-EUROWATER has delivered tailor-made solutions to steam boilers. We have dimensioned, manufactured, and installed numerous facilities throughout the world. Therefore, we have a wide knowledge and comprehensive experience with the many

issues and requirements governing make-up water production for high-pressure boilers.

The ability to design and dimension the best possible water treatment plant for a boiler rests on many factors: requirements for feed and boiler water, steam quality, boiler capacity and pressure, make-up water needs, price of water, electricity, consumables as well as a chemical analysis of the raw water.



Component	Recommendation
pH at 25°C	> 9.2
Conductivity at 25°C	< 0.2 µS/cm
Silicic acid SiO <sub>2</sub>	< 20 ppb
Total hardness	< 0.005 °dH
Oxygen	< 20 ppb
Iron, total	< 0.02 mg/l
Copper, total	< 0.003 mg/l
Oil/grease	< 0.5 mg/l
TOC	< 0.2 mg/l

Example of requirements for make-up water from a boiler manufacturer.

# Inspiration (References)

EUROWATER customers include: E.ON, Vattenfall, Fortum, Ørsted (DONG Energy), RWE, Hitachi Zosen, BWSC, Kraftanlage Munchen/Hamburg, Babcock & Wilcox Volund, AET, Gothenburg Energy, and many more.

# More inspiration

No two solutions are the same: Water quality, application, water consumption, operating conditions, physical environment, and other factors affect the system composition and configuration.



# Pure water treatment since 1936

A water treatment plant is a long-term investment, and naturally we use the best materials available. The life expectancy of our water treatment solutions are often 25 years.



SILHORKO-EUROWATER has many years of experience in development, production, sales, and service of reliable long-term water treatment plants with minimum maintenance needs – all tailored to your custom requirements. The secret lies in choice of materials, technical know-how, and dedicated employees. We guarantee quality and performance!

We currently employ about 400 employees throughout Europe.

Our plants are sold internationally through subsidiaries and dealers under the name of EUROWATER.

*The water treatment plants are designed and produced at our factory near Aarhus, Denmark.*

## Operational safety is essential

We manufacture reliable water treatment plants with a very long service life. Our base is solid knowledge of water treatment, both theoretically and practically, in interaction with well-proven and acknowledged technologies and components.

Our skilled engineers constantly strive to develop and improve the products and solutions. This is done in close cooperation with subsuppliers and customers.

The many years of experience, own in-house production, and a modular pre-engineered system all guarantee reliable solutions, short delivery times as well as competitive pricing.

## From consultancy to complete solutions

SILHORKO-EUROWATER offers consultancy, water analysis, non-binding offers and draft proposals, dimensioning and design, installation, and commissioning.

We also offer training of operating personnel as well as subsequent service – including preventive maintenance and service agreements.

In short: Everything from consultancy to complete solutions.

