



Water Treatment with a Vision

Krüger is specialised within the field of **drinking water, process water, municipal and industrial wastewater, sludge, sewage, soil and groundwater** as well as **control, regulation and supervision of water treatment plants**. Krüger acts as **consultant, contractor** as well as **supplier** of equipment, services and solutions.



A Competent and Innovative Partner

Krüger – A competent partner

- 111 years of experience in water and wastewater treatment
- More than 500 dedicated employees with excellent language and inter-cultural skills
- A long history with 80 percent of the wastewater market in Denmark
- A working knowledge of the international market since the 1980s
- More than 1500 reference plants around the world
- World leader in nutrient removal with more than 300 references

Design & Build experience

- International experience in contract management of large D&B projects
- Innovative cost-saving solutions
- Successful cooperation with internal as well as external partners

Krüger has significant experience and expertise in water and wastewater treatment. The processes and technologies developed by Krüger are widely used in many countries.

Krüger is dedicated to the development of new technologies to improve effectiveness and optimise operations. The innovative solutions are adapted to local needs. Value can be added e.g. by the recovery of energy, reuse of water, and extraction of raw materials.

Krüger acts as a consultant, a contractor and a supplier of equipment, services, technologies and solutions. The core competencies include everything required to design, build, operate, maintain, control, regulate, supervise and upgrade municipal and industrial water- and wastewater treatment plants and sewerage systems.

Additionally, Krüger is active in the fields of drinking water, industrial process water, sludge treatment, design and control of entire sewerage systems, and remediation of soil and groundwater.

Krüger manages the activities of its parent company, **Veolia Water Technologies**, in Denmark.

Drinking Water Treatment

To ensure water supply quality and safety, we offer an array of treatment solutions including:

- Pretreatment and purification
- Specific treatments (removal of arsenic, uranium, nitrates, endocrine disruptors, Total Organic Carbon, etc.)
- Disinfection
- Desalination
- Sludge treatment
- Water treatment chemicals
- Mobile Water Treatment



Selected references

- Lam Son - Sao Vang Water Supply System, Vietnam
- Tan An, Long An Water Supply Company, Vietnam
- Oslo Waterworks, Norway
- Thule Air Base, Greenland
- Partido Water Supply, the Philippines

Clean Drinking Water is Essential to Human Health

We improve the performance and safety of municipal facilities by using first-in-class technologies and water treatment additives, by treating bacteria and micro-organisms and by removing pesticides, arsenic, heavy metals and other hazardous substances. We are experts in proper treatment and management of surface and ground water.

Our commitment to ensuring safe, dependable and affordable drinking water is backed by decades of hands-on experience at hundreds of water treatment facilities around the world and cutting-edge research capabilities.

Remediation of Soil and Groundwater

In-Situ Thermal Soil Remediation (ISTD) is a robust, proven and patented technology for heating the subsurface to remediate soil and groundwater.

The ISTD can also be used for above-ground treatment of contaminated soil to eliminate the need for off-site disposal.

ISTD is recommended for:

- All organic contaminants
- All soil types
- Remediation above and below the water table
- Inside buildings, near infrastructure
- In fractured rock

Selected references

- Da Nang Airport, Vietnam
- Reerslev, Denmark
- Maarheeze, The Netherlands
- Odense, Denmark
- Monthey, Switzerland

High remediation efficiency: Proven removal rates of > 99.0 percent



CASE: New Waterworks in Lam Son and Sao Vang

Krüger is working together with colleagues from Vietnam on a project for a new waterworks that is to supply drinking water to the two towns Lam Son and Sao Vang, including their catchment in the northern Vietnam. The project also comprises the supply of a pumping station and distribution network.

Area Sales Manager Kjeld Koler, Krüger A/S, participated in the negotiations with the local utility company, Lam Son – Sao Vang Water Supply System. He says:
– We treat and disinfect the raw water that is pumped from the local river Chu, and distribute the treated water to the small towns. The project ensures that more than half of the local people get access to drinking water from a municipal waterworks. This is significantly more than the average of the Tho Xuan-province in which the two towns are located. The waterworks is designed for a capacity of 8,500 m³/day, but prepared

for double the capacity. The treatment is performed in a Multiflo[®] Classic-plant developed by Krüger's parent company Veolia Water. Kjeld Koler says:
– Multiflo[®] is based on a particularly sturdy, chemical treatment technology that proves its efficiency daily in waterworks all over the world. In combination with pre chlorination and final chlorination it supplies a water quality that complies with international standards. The drinking water is distributed to the consumers through a booster pumping station into a 68 km long distribution network.

The project is financed through official development assistance (ODA) from Danida and is executed by Krüger in collaboration with Veolia's offices in Ho Chi Minh City and Hanoi. It will be handed over in the middle of 2015 to the benefit of the 65,000 inhabitants in Lam Son – Sao Vang and catchment area.

CASE:

Upgrading of Wastewater Treatment Plant at Limassol, Cyprus.

The Client, SBLA, is expected to produce 40,000 m³ municipal wastewater/day from the Limassol City and the surrounding municipalities.

The treatment of the wastewater must comply with the legislation set up by the Water Development Department under the Ministry of Agriculture, and the wastewater is to be reused for irrigation on farmland, industry, hotels and green areas. The treated wastewater can only be discharged to the sea in emergency situations.

Furthermore, SBLA wants to reuse as much energy and fertiliser as the surplus sludge of the plant can supply in the form of power, heat and nutrient-rich, treated sludge for disposal on farmland.

Based on the above, Krüger proposed to install an activated sludge treatment plant for removal of carbon and nutrients from the water phase, a Bio Denipho™ plant, anaerobic sludge treatment of both primary and secondary sludge with biogas production and a Combined Heat and Power production unit (CHP unit), with

production of 200 kWh/h to reduce the power consumption needed for the entire plant.

- Bio-Denipho™ activated sludge plant for removal of carbon and nutrients P and N
- Sand filtration unit for removal of suspended solids, SS
- Digestion complex with Krüger's flat roof digesters and gas-lock
- CHP unit with utilisation of biogas for power production

Benefit to the Client:

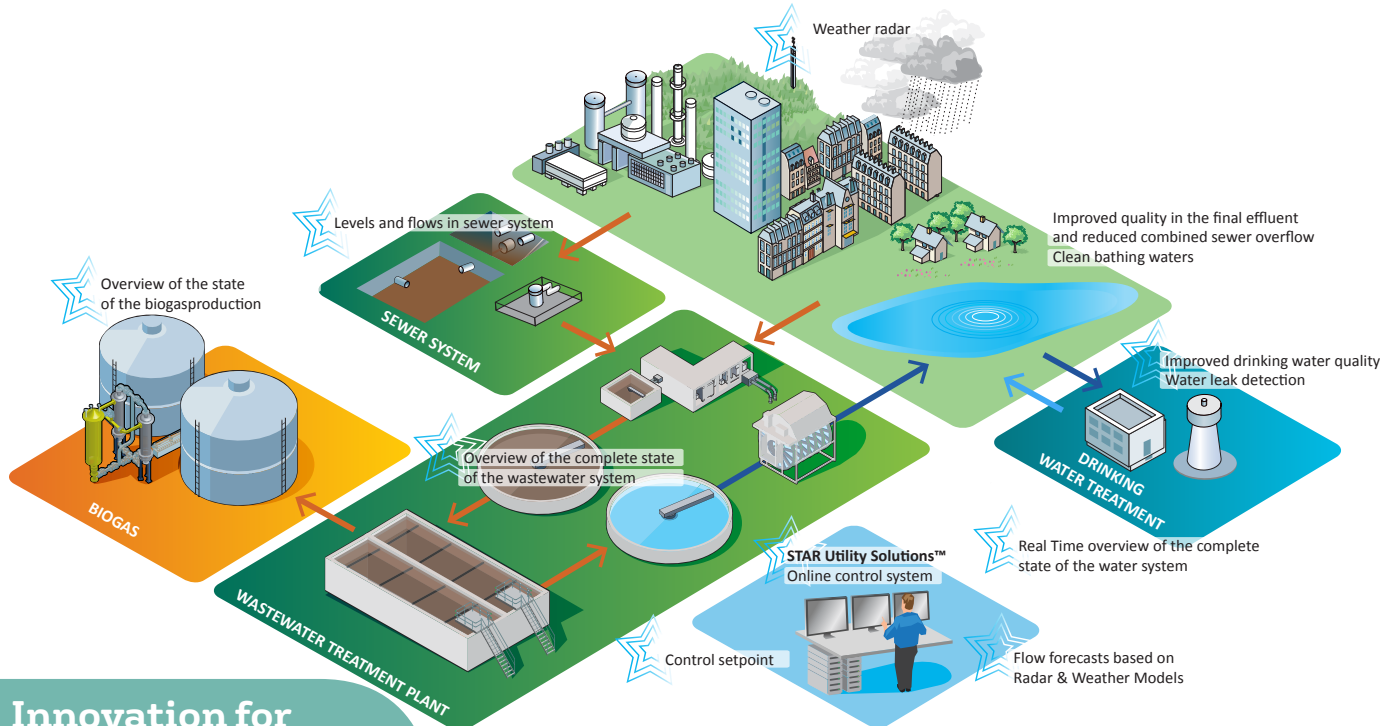
The Limassol plant was commissioned in 2008 and has been in continuous operation since then. The plant has helped SBLA to comply with the stringent effluent demands with regard to the requirements related to the irrigation as well as the Sensitive area.

Krüger's advanced control program, STAR Utility Solutions™ system ensures a smooth, daily operation.

The installation of the CHP unit secures a saving in energy consumption of 35-45 percent.



Advanced Control Systems



Innovation for Water Resource Management

The development of STAR Utility Solutions™ started in 1990. Since then, Krüger has gained more than 400 years of valuable operating experience from more than 60 plants all over the world.

We still continue to develop the system to fit all aspects and needs related to water resource management.

STAR Utility Solutions™

Specially designed with focus on

- Safety
- Operating costs
- Performance

This is the most sophisticated suite of modular intelligent software solutions on the market.

The comprehensive suite of solutions offers state-of-the-art online control and overview.

Based on advanced real time control and forecasting, the intelligent tools continuously provide optimal operation and maximise the value of the existing systems.

Major advantages

- Capital savings
- Reduced operational cost
- Better effluent quality
- Reduced sludge escape and footprint

Sewer Systems

-A serious health and environmental concern

We optimise the sewer system and ensure a safe effluent discharge. Based on a comprehensive overview of the sewer system and its interaction with its recipients, we identify the need for climate adaptation, upgrading and replacement of sewers as well as upgrading of the supply infrastructure. Good sanitary conditions are all-important to the public health and we have many years of

experience in preparing integrated end-to-end solutions covering all relevant local conditions.

We act primarily as consultants in:

- Models and hydraulics of the network
- Planning and optimisation
- Advanced online control, monitoring and forecasting

Selected references

- Copenhagen, Denmark
- Muscat, Oman
- Sofia, Bulgaria
- Milwaukee, USA
- Dubai, United Arab Emirates

Wastewater Treatment

Water is too valuable to be used only once

Our wide range of solutions and technologies are all dedicated to increase the use of water and wastewater resources. We provide all technologies relevant to a safe, environmentally compliant day-to-day operation of a wastewater treatment plant, regardless of size.

Our solutions contribute to customised, efficient and cost-effective plants and processes covering the

complete wastewater treatment cycle:

- Primary treatment
- Secondary treatment
- Tertiary treatment & reuse
- Sludge treatment
- Odour control
- Water treatment chemicals
- Mobile water treatment
- Lagoon guard

Selected references

- Warsaw, Poland
- Huaian City, China
- Limassol, Cyprus
- Partido, The Philippines
- Alcantara, Portugal

Sludge is a resource of great value

Selected references

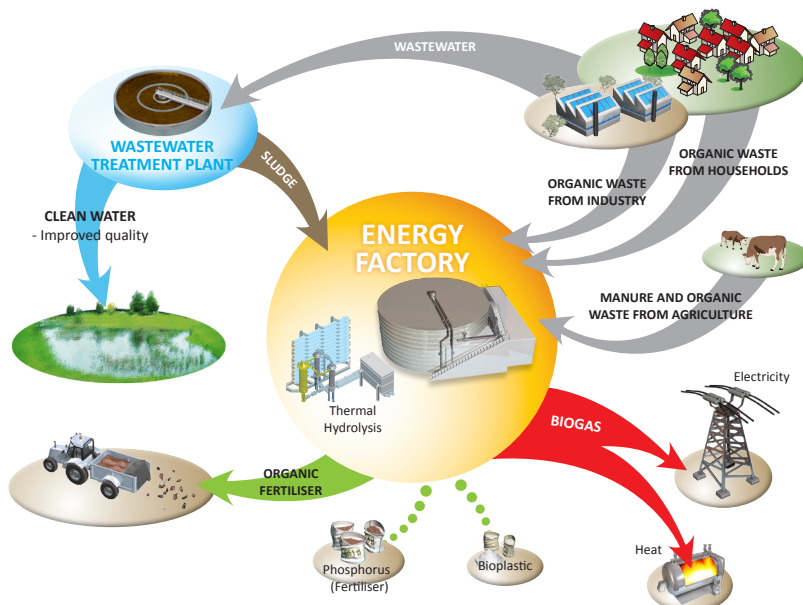
- Marquette-Lez-Lille, France
- Western Wake, USA
- Vigo, Spain
- Pomorzany, Poland
- Billund BioRefinery, Denmark

By converting sludge into energy, we help offset wastewater treatment plant operating costs.

Our designs minimise sludge generation in the initial phases of water treatment. We minimise weight and volume of the sludge remaining after recovery, and remove harmful substances prior to disposal. Our sustainable treatment solutions comply with the stringent health and environmental standards.

We have developed the below technologies for treatment and resource recovery:

- Exelys™ and Biothelys™, our thermal hydrolysis solutions
- Anita™ Range for sidestream treatment of high-ammonia loaded effluents
- Biocon™ and Biocon™ ERS, low-temperature thermal drying
- Pyrofluid™, sludge incineration
- Gaslock



Among our latest projects:

Billund BioRefinery in Denmark, is a wastewater treatment plant converted into a biorefinery capable of producing energy as well as recovering valuable raw materials (phosphorus) and by-products such as biopolymers.

This project is honoured with EU's Environment Award and the Svend Auken Award, a Danish environmental award.

www.billundbiorefinery.dk/en

Resourcing the world

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