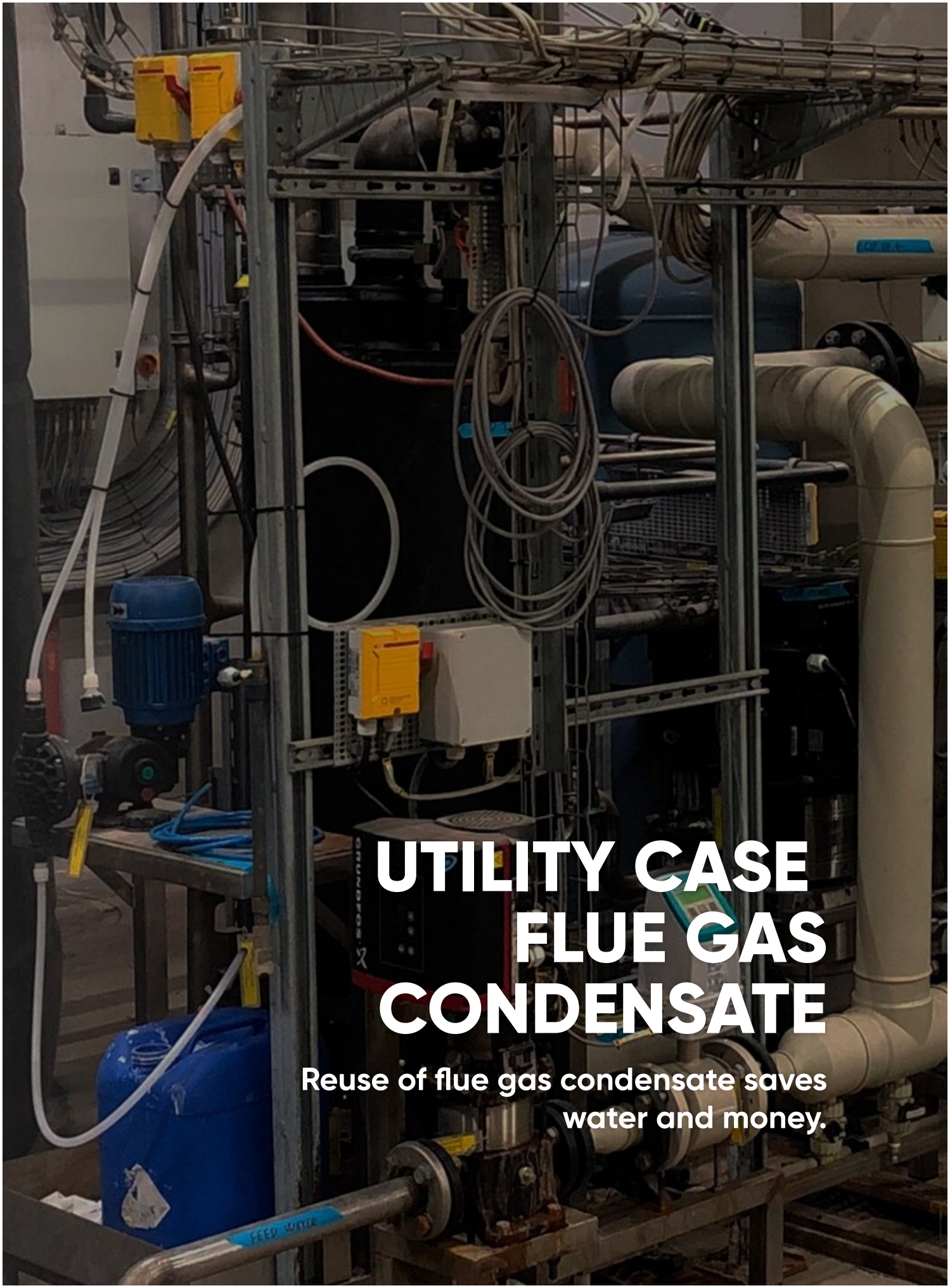
LIQTECH



UTILITY CASE FLUE GAS CONDENSATE

Reuse of flue gas condensate saves water and money.

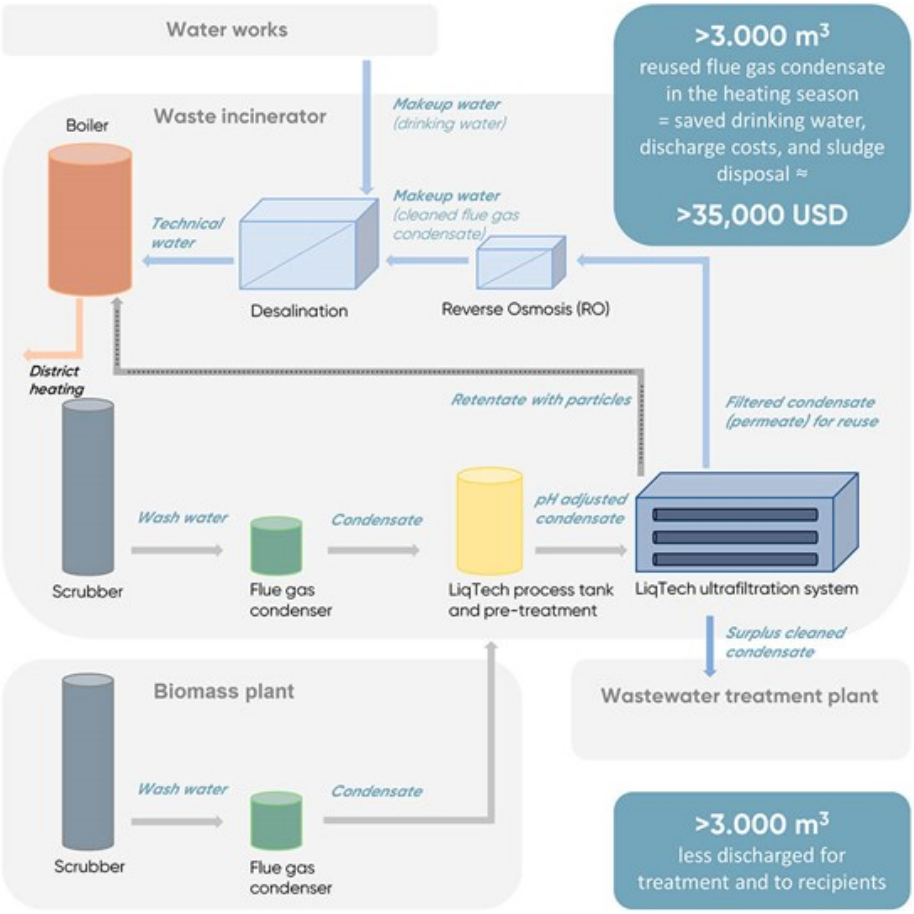
Reuse of Flue Gas Condensate

Danish combined heat and power plant has identified multiple ways to reuse ultra-filtrated water as well as energy from their waste incineration and biomass plants.

At the end of 2014, a new flue gas condensing plant was implemented at the incineration plant, primarily to recover energy for use in the district heating system – thereby increasing the plant's overall efficiency. At the same time, they chose to install a system with ceramic silicon carbide (SiC) membranes from LiqTech for ultrafiltration (UF) of the flue gas condensate, which contains particles, organic matter, salts, and harmful heavy metals.

- Ultrafiltration with cross-flow silicon carbide membranes, buffer tank, integrated backwash, and Cleaning-in-Place (CIP)
- Installed in 2015
- Capacity of 6 m3/h
- Annual savings >35,000 USD from saved drinking water (approx. 3,100 m3), less wastewater, and no sludge for disposal

Treatment and recycling of the combined heat and power plant's flue gas condensate



Objective: Reduce consumption of scarce resources

"*Our overall purpose with the filtration system was to be able to reuse the filtered water as makeup water in the desalination plant that supplies technical water to the incinerator's boiler instead of using valuable drinking water,*" says the project manager at the combined heat and power plant. "*However, it was the reduction of scarce resources rather than cost savings that drove the project.*"

As a supplement to ultrafiltration and to meet the requirements for water used as makeup water to produce technical water, a reverse osmosis (RO) plant was subsequently installed to desalinate the UF-permeate in order to reach the goal of maximum recycling and minimum discharge.

Many ways to recycling of residues – and financial gains

As another example of waste reduction, the residue from the ultrafiltration (retentate containing removed particles and heavy metals) is sprayed into the incinerator's boiler. "This increases the water content in the flue gas, enabling us to extract additional energy from the flue gas condensation." Alternatively, the retentate could be dewatered, e.g., in a filter press, producing sludge for disposal.

"*In the last heating season from October to April, we reused approximately 3,100 m3 cleaned flue gas condensate. We used it primarily as makeup water to produce technical water and cool and moisten slag from the incineration process. We estimate that the reduced consumption of drinking water plus the saved costs related to wastewater discharge and sludge disposal result in a total savings of more than 35,000 USD per heating season.*"

Today, it is impossible to recycle 100 % of the flue gas condensate, as the combined heat and power plant produces and filters more condensate than can be reused on site. In 2017, a new wood chip-fired biomass plant was installed, and a large amount of the flue gas condensate from this is led through a standard tank to the incineration plant's ultrafiltration system, which has a capacity of 6 m3/hour. The RO plant's capacity of 6 m3/hour is sufficient to cover the plant's need for recycled water. The surplus amount of condensate is led to the sewer directly after ultrafiltration in the ceramic LiqTech membranes, which in addition to removing suspended solids, heavy metals, and other unwanted particles, also adjust the pH of the flue gas condensate by adding sodium hydroxide (NaOH).

24/7 operations demand a robust and reliable UF-system

The utility's incineration plant and biomass plant operate 24/7 all year except for a few weeks of maintenance in the summer. This puts great demands on an ultrafiltration system that must run optimally with maximum capacity and ensure constant, high retention of unwanted substances.

Thanks to a robust design and durable silicon carbide membranes, the LiqTech system can manage the task.

To avoid membrane fouling - and unplanned downtime - the membranes are backwashed at predefined, regular time intervals. Backwashes are initiated automatically and controlled via the utility's SCADA system. Additional cleaning-in-place (CIP) is performed as needed. CIP is based on the differential pressure on each side of the membranes and is optimized using sequence control. The UF system and the RO system are controlled and monitored from the utility's central control room.

All requirements met

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The filtration system from LiqTech fully lives up to our expectations as well as our requirements and the process guarantees given. In addition to cleaning the flue gas condensate to well that we always comply with the authorities discharge limits, we can also reuse the cleaned water. This enables us to save both drinking water and money. You could say that we have killed two birds with one stone.

Utility Project Manager

Talk to an Expert

Please do not hesitate to contact us if you need help with a liquid filtration system.

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