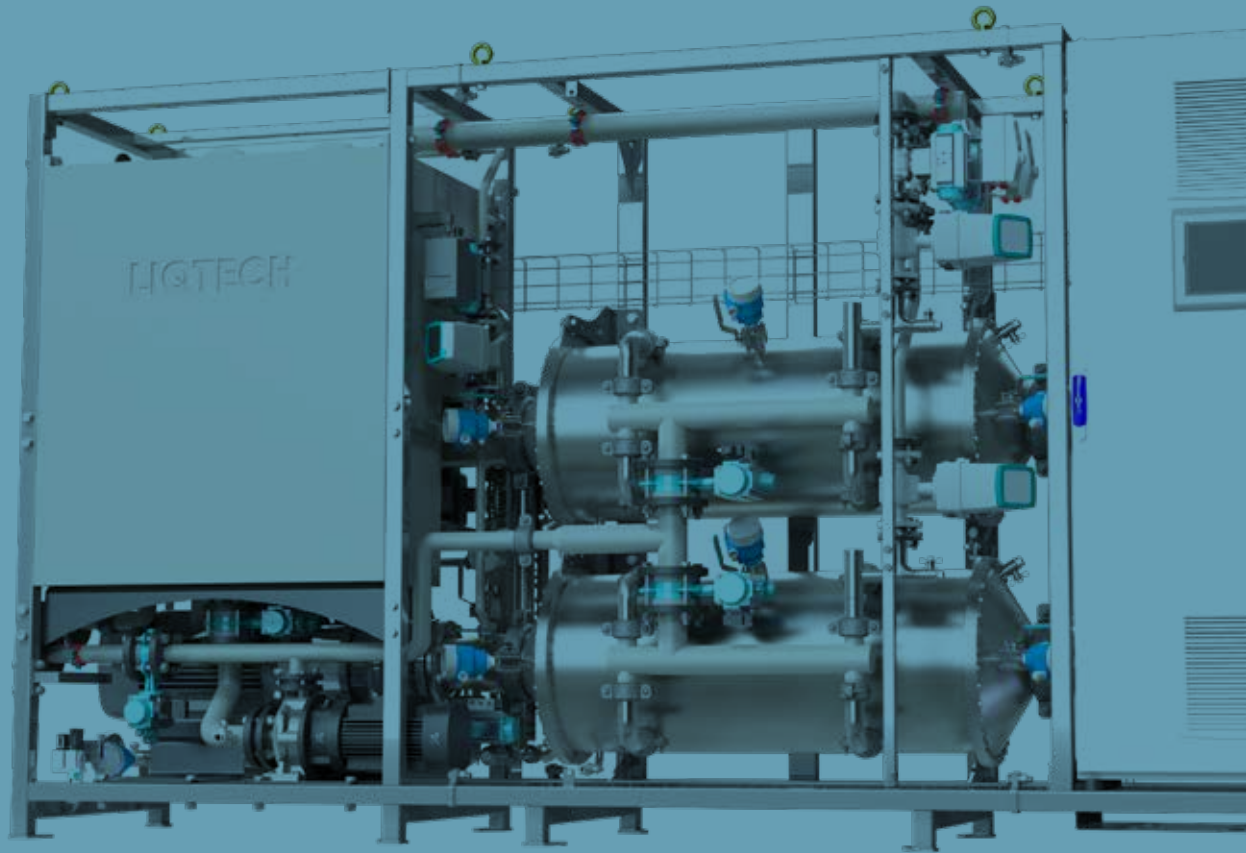


# LIQTECH



**MK7, Power Plant  
Process & Modules**

**LIQTECH**

# IMPROVING OUR FUTURE

The world is running out of clean water resources, which makes it essential that we treat the resources we have with respect and care. LiqTech has developed a unique ceramic membrane capable of removing oil, pathogens, heavy metals, etc., from water, thus providing robust filtration solutions for essential applications.



## Power Plant Filtration – Based on Your Requirements

### Overview

LiqTech's 7th generation water treatment system (MK7) for the cleaning of scrubber water and flue gas condensate is designed to remove soot and other particles captured by the scrubber process, producing a permeating quality well below official requirements for limit values for heavy metals and other particulate matter. The core technology in this process is LiqTech's patented silicon carbide (SiC) membrane, which is extremely chemically resistant to both strong acids and bases, as well as hydrocarbons. The water treatment unit (WTU) is a fully automated system that controls permeate production, sludge production, chemical dosing, backwashing, and periodic chemical cleaning of the membranes.

In the MK7 WTU, housings of 99 or 137 tubular ceramic membranes are arranged in a crossflow filtration configuration. Crossflow configuration is usually used in membrane filtration for challenging, high-fouling applications—such as flue gas condensate.

The permeate produced requires no additional treatment and can be discharged or reused for other purposes, e.g. in the scrubber process. Condensate reuse for district heating requires additional treatment through an RO unit.

The resulting sludge can be handled as a pumpable liquid, or further dewatered to a filter cake for storage and handling.

The MK7 WTU benefits from a pretreatment step that removes coarse material and coagulates very fine material. LiqTech has developed a pretreatment solution for this purpose.

To accommodate retrofit scenarios and new buildings alike, the MK7 WTU is designed as a standardized modular system enabling it to be installed wherever space is available.

### Process overview

The pretreatment consists of a coagulation step. Coagulation is done by injection and mixing iron chloride and adjusting the pH for optimum reaction characteristics.

The ultrafiltration step utilizing the LiqTech ceramic membrane produces dischargeable permeate and sludge water. The recovery is typically as high as ≥95%, meaning ≥95% of inflow to the filtration module

- + 20+ years of experience in the filtration industry
- + 300+ water treatment systems installed worldwide
- + Selected by Market Leaders
- + Water treatment solution customized to your needs

ends as permeate. At regular intervals, each housing is backwashed briefly, adding to sludge production. Before permeate production can no longer be recovered with backwashes, a chemical "cleaning in place" (CIP) is performed to restore capacity.

Post-treatment aims to turn sludge water into a dewatered filter cake:

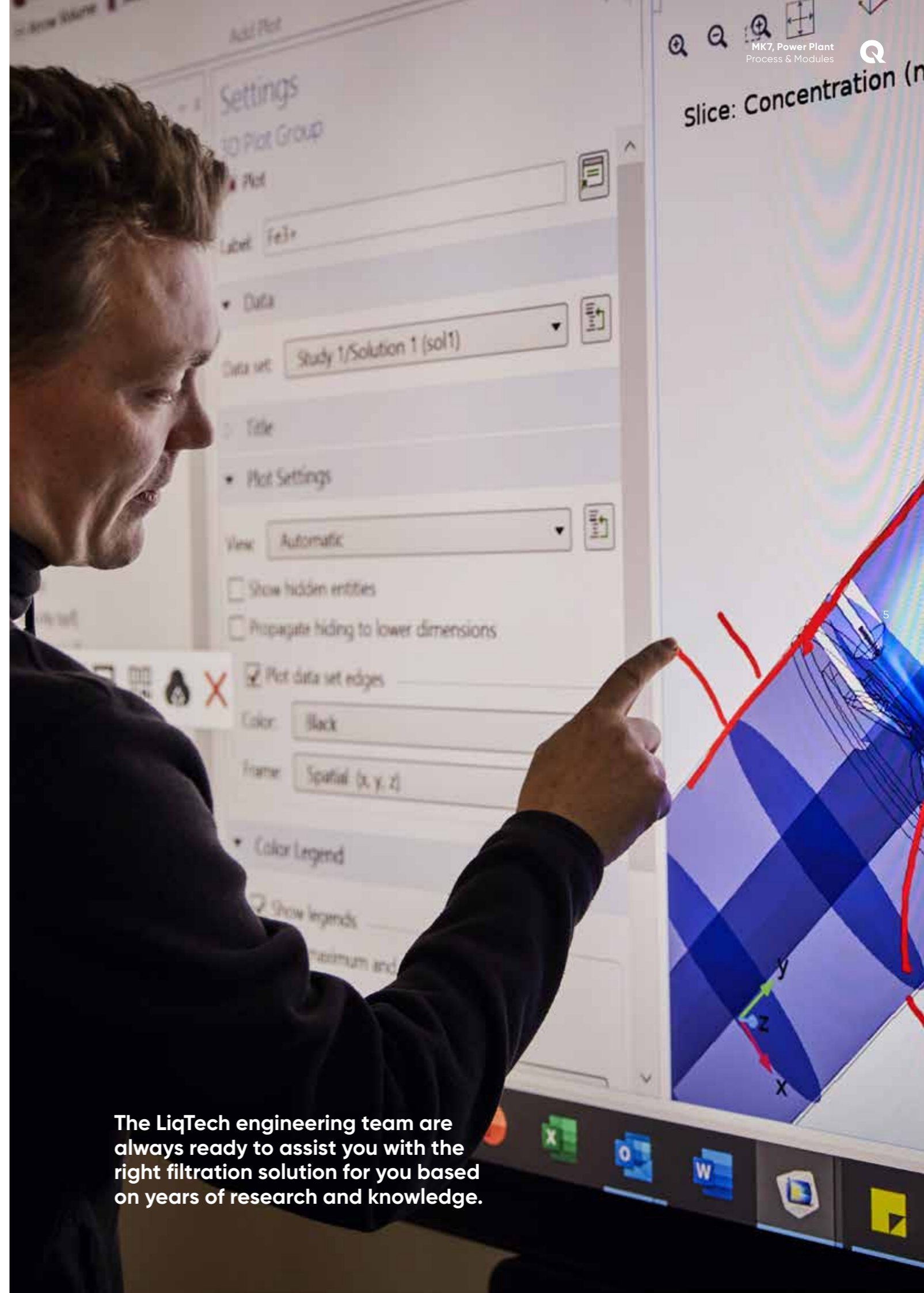
- The filter press dewateres the sludge, and reject water from this process can be returned to the wastewater tank. We also offer automated dosing of filter aid.

In addition to these processes, other ancillary equipment may be required to facilitate installation at different levels.

In general, the modules are designed to operate closely together on the same level.

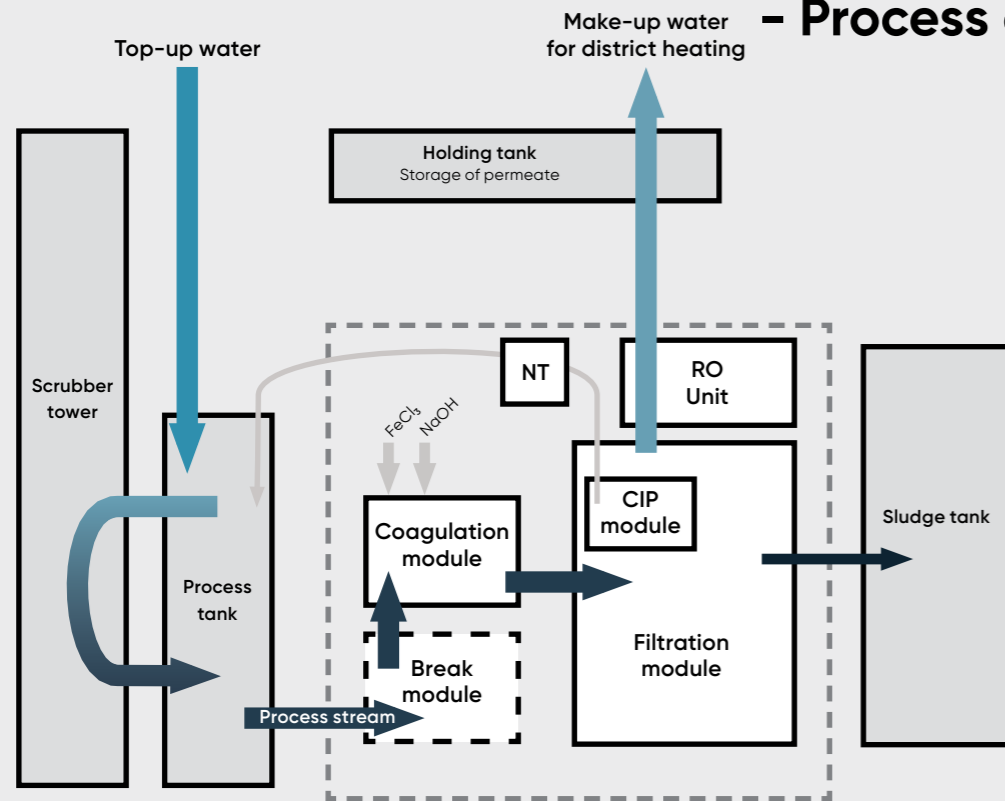
Based on more than 20 years of experience in the filtration industry and more than 300 water treatment systems installed worldwide, our team of highly skilled engineers are ready to assist you by providing the right solution for your requirements.

Please read more about the filtration process and WTU modules on the following pages. If you have any questions, please do not hesitate to contact us.

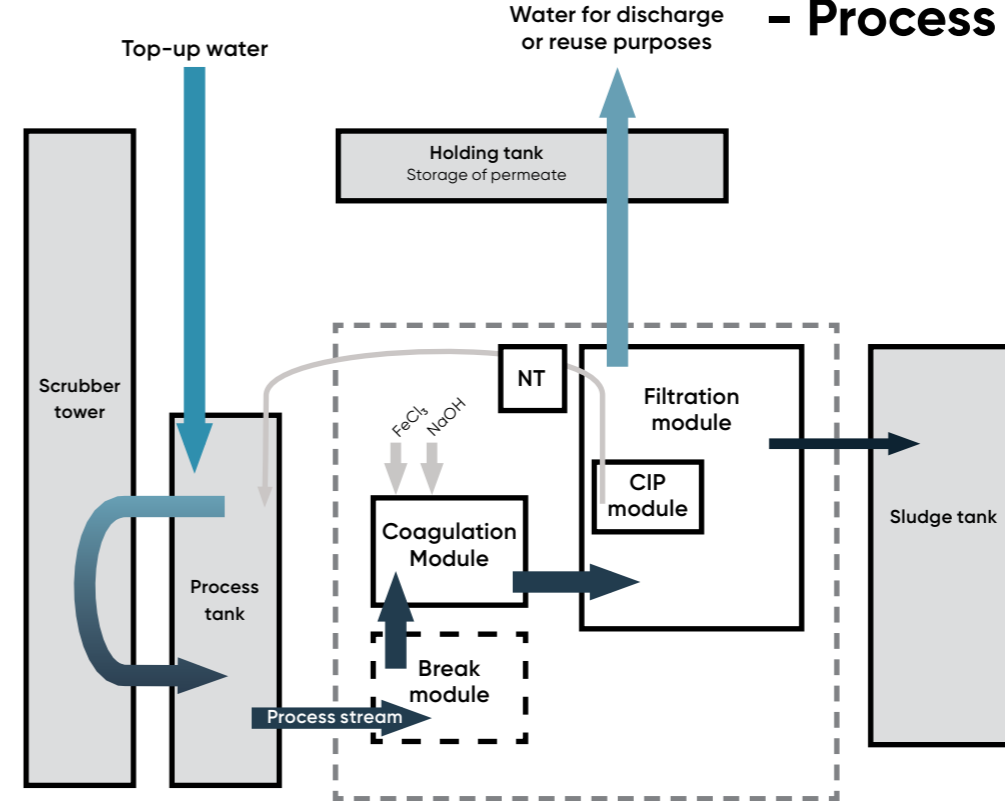


**The LiqTech engineering team are always ready to assist you with the right filtration solution for you based on years of research and knowledge.**

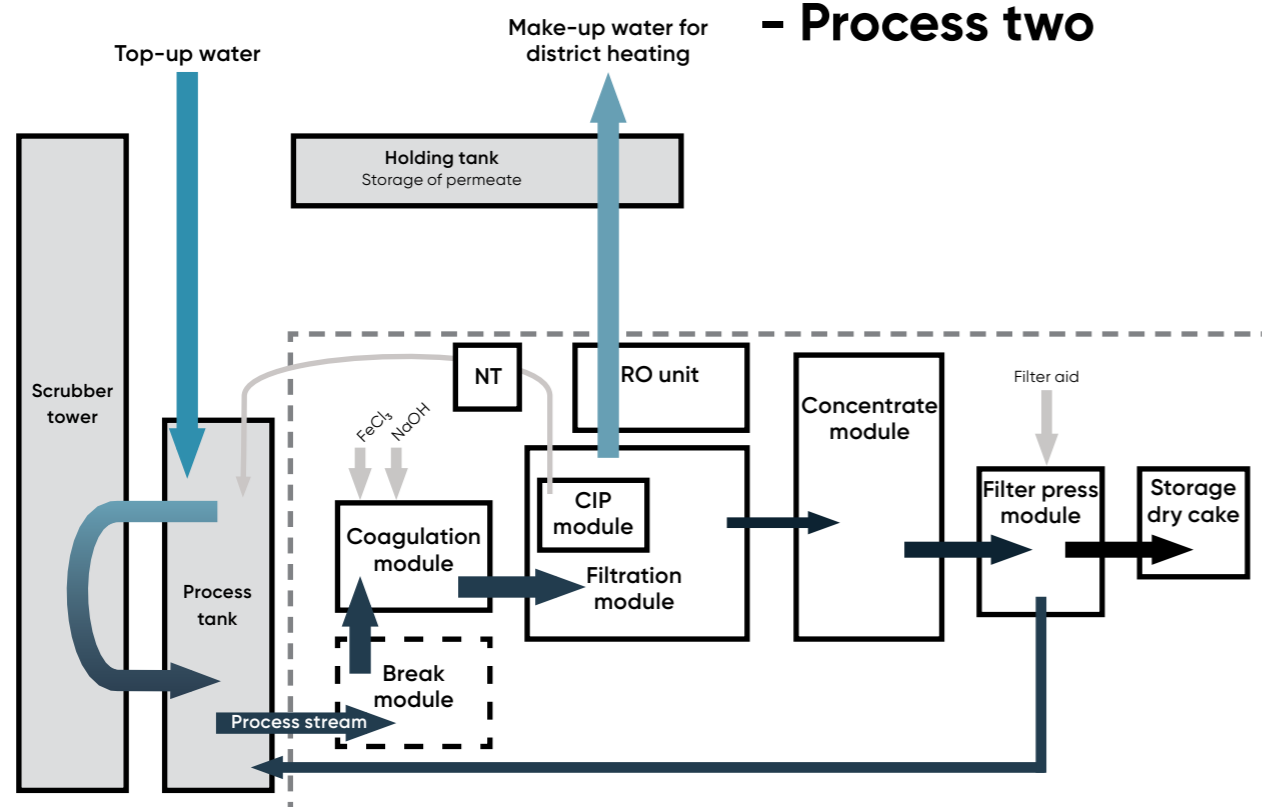
### Wastewater reuse - Process one



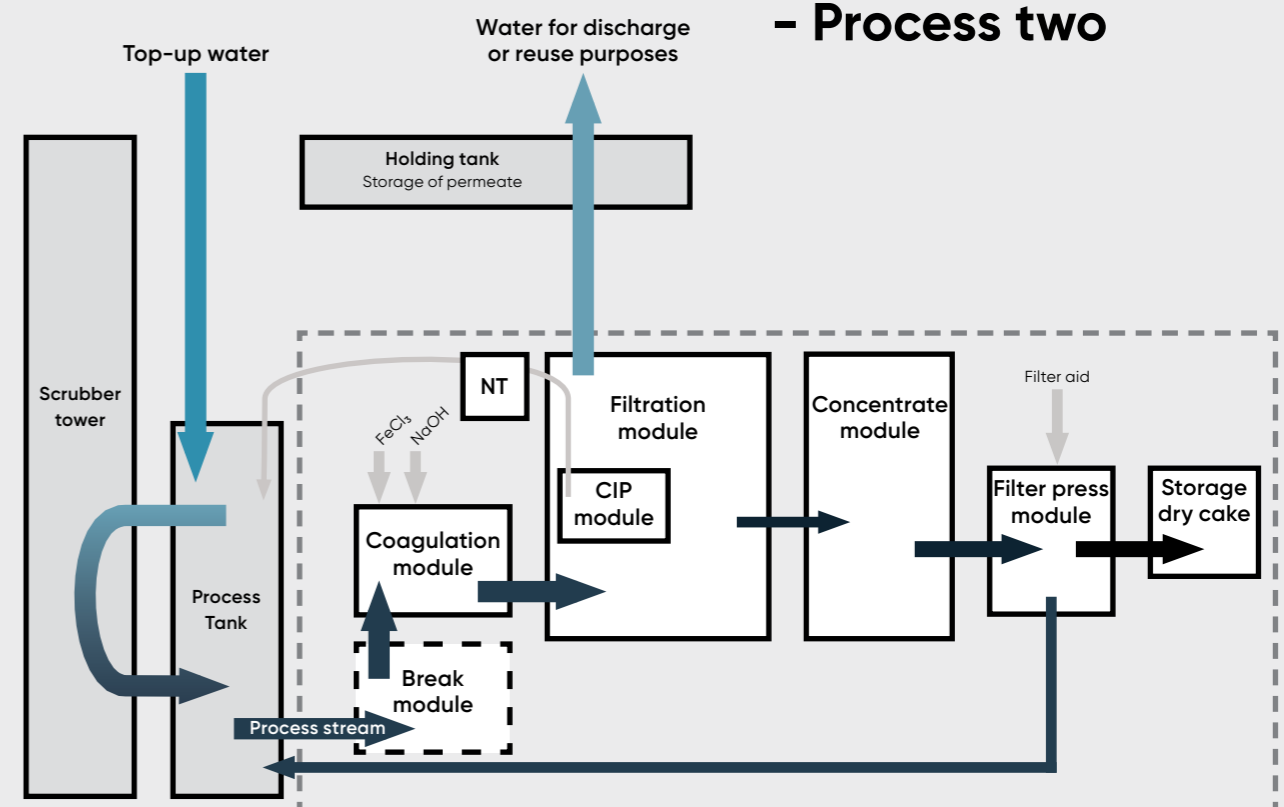
### Wastewater discharge - Process one



### Wastewater reuse - Process two



### Wastewater discharge - Process two



## Filtration module

The heart of the WTU (Water Treatment Unit) is the filtration module with LiqTech's ceramic filter elements in a crossflow configuration, providing ultrafiltration capabilities of highly fouled water. The filtration module is available in different capacities.

The filtration module is available as a master unit alone, or in a master and slave configuration.

### Master

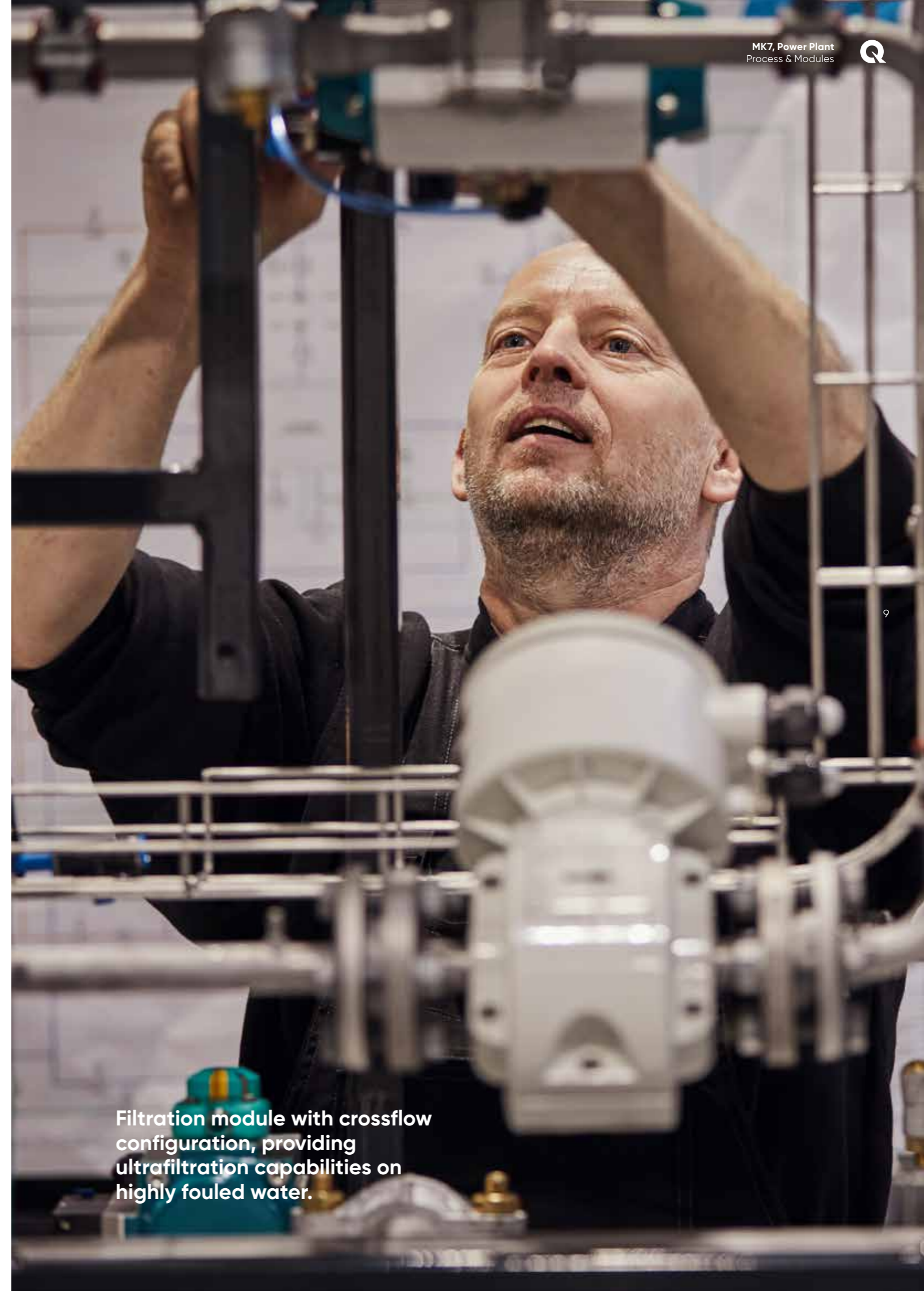
The master unit holds either 1 or 2 filter housings, backwash pump, permeate tank, crossflow pump, sensors, external fluid and pneumatic connections, CIP system with chemical dosing, backwash system, HMI, and main electrical cabinet. The main electrical cabinet can optionally be placed "off-skid".

### Slave

The slave unit functions as an optional addition to the master unit to expand system capacity, utilizing the same permeate tank and backwash system. The slave unit is always configured with 2 filter housings. All fluid and pneumatic connections on the slave unit, except for the two CIP inlets, interface with the master unit.

The slave unit must be bolted together with the master unit and cannot be placed in a different location.

- ⊕ Ultrafiltration providing limit values of heavy metals & other particulate matters well below authority requirements
- ⊕ Integrated clean-in-place
- ⊕ Integrated backwash
- ⊕ Modular system design for flexible installation
- ⊕ Fully automated system



Filtration module with crossflow configuration, providing ultrafiltration capabilities on highly fouled water.

## Break module

A break module is an optional buffer tank that is required if the feed pressure from the process tank exceeds 0.5 bar(g) at the filtration module, through a non-operating feed module, or 0.1bar(g), at a coagulation module. The size of the tank is determined by the filtration capacity and the level regulating possibilities.

- ⊕ Optional buffer tank



## CIP module

The chemicals used in the CIP (clean-in-place) sequence are supplied from two CIP tanks each containing an alkaline and an acidic cleaning solution. The CIP sequence optimizes the operation and performance of the filtration module.

The CIP modules exist separately from the filtration module to allow larger chemical storage capacity and to remove potential damaging vapors/spillage from sensitive instrumentation. The CIP module consists of a tank with capacity for multiple CIPs, a dosing pump, and level switches.

The CIP module has a chemical storage capacity of 100 liters. It is also possible to dose chemicals directly from chemical storage tanks.

- ⊕ Used for CIP
- ⊕ For optimal performance of filter module



## Coagulation module

The coagulation module coagulates the particles from process water to facilitate more efficient removal.

The coagulation module uses  $\text{FeCl}_3$  for the coagulation process. The coagulation module has a storage capacity of 800 liters.

- ⊕ Coagulation of dissolved heavy metals
- ⊕ Increased effect of filter module by increasing particle sizes
- ⊕ pH control for optimal particle coagulation



## Neutralization (NT) module

The neutralization module neutralizes CIP fluids for further processing in the filtration system. The neutralization module is optional.

- ⊕ Neutralizes CIP fluids for further processing
- ⊕ Reject water returned to process tank



## Concentrate module

The purpose of the concentrate module is to flocculate the particles received from the filtration module to facilitate further dewatering in the filter press.

- + Flocculates dispersed matter
- + High-pressure pump for filter press



## Filter press module

Filter press module with integrated reject handling. The filter press takes sludge from the concentrate tank and dewateres it to a filter cake.

The reject water is returned to the process tank.

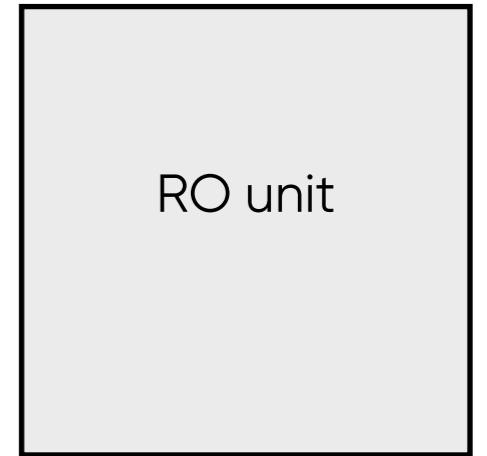
- + Delivers a filter cake for easy storage and handling
- + Returns reject flow to process tank



## Reverse osmosis (RO)

The purpose of the RO unit is to desalt the permeate to reach requirements needed for reusing the water as make-up water for district heating, etc.

- + Make-up water for district heating, etc.





## End-To-End Service

At LiqTech, we have everything in-house. This is crucial for our customers because they want to work with filtration experts, and they want to work with a company that knows its technology and equipment in detail.

### Technical sales support

Our technical sales team are highly experienced, expert engineers with years of experience, which enables them to discuss with and advise our customers on the best system configuration for any type and size.

### Process engineering consulting & chemistry

Twenty years of manufacturing water filtration systems and filters has made LiqTech process and chemical engineers expert advisors in helping our customers choose the best filtration solution, chemicals, and dosage suited for the application. We provide the most reliable flue gas condensate wastewater treatment systems available on the market.

### System design

The LiqTech system is modular, enabling various treatment capacities to match the needed requirements in scrubbing. Our flexible systems meet your needs for different water purity levels, processes, waste treatment and handling, and preferred choice of chemicals.

The LiqTech system components include:

- Neutralization tank: Neutralizes CIP fluids for further processing in the filtration system.
- Sedimentation and dewatering system: Facilitates improved system performance, waste volume limitations, and handling of solids or liquids.
- Post-treatment: Reverse osmosis (RO), nanofiltration (NF), carbon filter (GAC), etc.

You may have a unique filtration requirement in order to better match the scrubber and process, including water polishing. The LiqTech design team are happy to partner with you and optimize the complete system to meet your needs.

### Project management

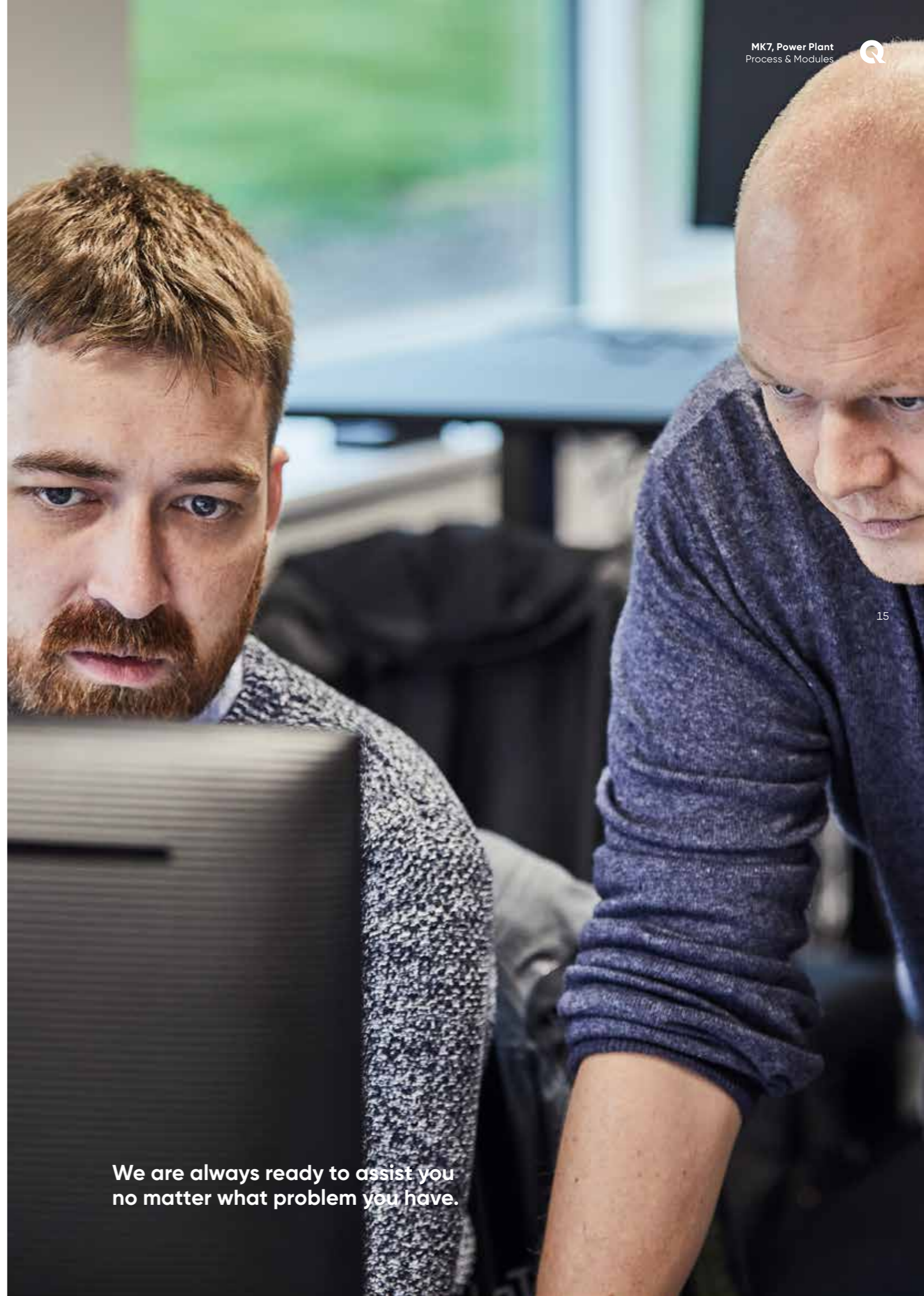
The LiqTech project management team have successfully delivered more than 300 high-quality industrial wastewater systems to our customers on schedule. The individual project managers are experienced in turnkey wastewater systems for power plants and are given ownership of separate projects, ensuring dedicated focus on customer contacts and systems. Leading up to a factory acceptance test (FAT) and system delivery, or whenever a current status update in the building process is needed, that appointed person is always available and ready to report to the customer's representative.

### Service & commissioning

LiqTech will support your system. We support you by:

- Providing technical support to your staff, who get in-depth, expert assistance from our highly qualified team of service engineers throughout the process, from sales to operations and repair.
- Providing live demonstrations and in-house training
- Performing a preshipment FAT on every system, ensuring that every delivered system works according to specifications.
- Providing on-site system commissioning of every system
- Continuously upgrading our control module operating system and providing our customers with these upgrades to ensure the best possible operating performance.
- Providing 24/7 support, giving you complete confidence in your LiqTech system. The team is always ready to assist through remote service and support on system installation, commissioning, system status, and preventative maintenance.

Based on our extensive experience of industrial wastewater, your flue gas condensate cleaning system will be fully supported by experts to meet your specific needs and to meet or exceed compliance requirements.



We are always ready to assist you  
no matter what problem you have.





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