AMSTERDAM
INTERNATIONAL
WATER WEEK

Abstract Title	Improved water quality by novel developed technologies; the way to durable solutions
Topic	x Improving water quality O Resilient water systems x Circular solutions: Reuse, Recover and Recycle O Transitions in water, agro/food and energy
Challenges and Solutions	Sustainable alternative invented and realized for outdated large scale base line surface water treatment
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Abstract	Surface water treatment for drinking water production using challenging sources, f.i. due to eutrophication or compounds of concern, will result in application of increasingly advanced technologies. In the past decade, application of suspended ionexchange and combinations of ozonation and inline coagulation with ceramic microfiltration have proven to be a novel robust combination for drinking water plants. New insights in the technologies, from development to full scale implementation in 210 MLD plants, will be shared in his work. Robust, integer and durable filtration, removing suspended matter, bacteria, protozoa and to some extent viruses is a core aspect of surface water treatment. Ceramic microfiltration is a technology meeting those aspects. State of the art ceramic microfiltration systems allowing multiple membrane modules in one pressure vessel, make this technology available for larger scale treatment plants. Especially plants relying on

challenging surface water, facing short filtration cycles and high membrane fouling potential, benefit from ceramic microfiltration systems holding larger number of membranes (CeraMac).

The expected long lifetime of ceramic membranes (20 years) provides an attractive total cost of ownership relative to polymeric systems. To further improve performance and efficiency of ceramic membrane systems (CeraMac), application of ozonation and coagulation is explored and applied. Ceramic microfiltration modules of MetaWater greatly benefit from residual ozone on the membrane, potentially doubling fluxes. As a consequence, the initial investment costs reduce substantially. Similar effects are found with coagulation prior to ceramic microfiltration. Coagulation systems such as clarifiers, lamella settlers or flotation systems resulting in a low solids loading, typically improve the ceramic membrane system performance greatly. High solids loaded systems such as compact inline coagulation (ILCA) applied for instance on river water with high suspended matter content, improve the ceramic membrane system performance as well. Combined ceramic membrane filtration (CeraMac) and coagulation systems, being high (ILCA) or low (clarified) loaded systems, provide robust integer surface water pretreatment for drinking water production.

A different angle is taken with ionexchange pretreatment systems, targeting dissolved natural organic matter. In the past decades, suspended ionexchange systems transformed from the innovation domain into a novel full scale treatment technology. It proved to be an effective alternative technology targeting natural organic matter, resulting in reduced disinfection byproduct formation potential in chlorinated systems. Other post treatment technologies such as activated carbon adsorption and advanced oxidation processes benefit strongly from ionexchange pretreatment as well. The suspended ionexchange concept SIX allows levelling off fluctuations in influent NOM concentration to stable, targeted NOM effluent concentration. In addition, the suspended ionexchange concept accepts higher levels of suspended matter in the feed water. Novel treatment concept SIX,

	requiring limited prescreening for the ionexchange, has become a standard in full scale practice. The topicality of compromised fresh water sources for drinking water production emphasize the need and necessity of advanced treatment technologies. Existing concepts remain relevant however require innovation. Large scale ceramic microfiltration, combined with coagulation or suspended ionexchange technology, remain a robust and durable pretreatment solution, an essential baseline in meeting the topical challenges in drinking water production.Up to 500 words (in total).
Figures/diagrams/illustrations	Up to 2 (in abstract)