

Effects of pretreatment on membrane performance in cow water purification to drinking water

Tibor Kretschmann, Robert Lutze, Envirochemie GmbH, Germany

The dairy industry is a voracious user of clean water but is working on approaches to reduce water intake through the implementation of innovative approaches to reuse wastewater and process water from dairy operations. As sufficient technologies are available, key issue is not whether to close water loops, but how can these loops be closed at economically and energetically acceptable costs. The sub-project "Living Lab East Frisia" in the EU research network B-WaterSmart (EU funding program Horizon 2020) focusses on the treatment of vapor condensate (cow water) to drinking water quality on a pilot scale.

The pilot plant has a flow capacity up to 5 m³/h, is fully automatized (for example equipped with online TOC analyzers from the company Hach Lange, Germany) and consists of a biological pretreatment followed by an ultrafiltration and a reverse osmosis (see figure 1). For more than two years now, the plant has been successfully operated and optimized by smoothening varying feed qualities, by adjusting operating parameters (especially for the biological step), and by adjusting cleaning strategies.

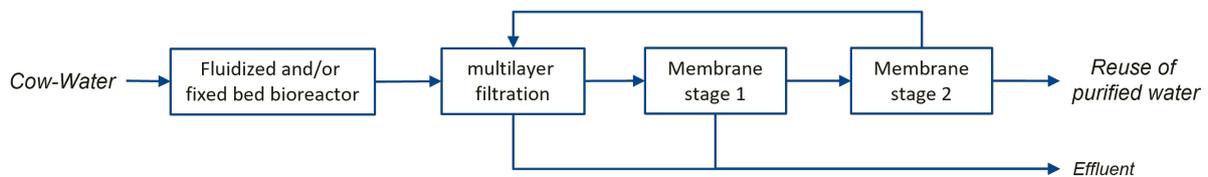


Figure 1. Process scheme of pilot plant

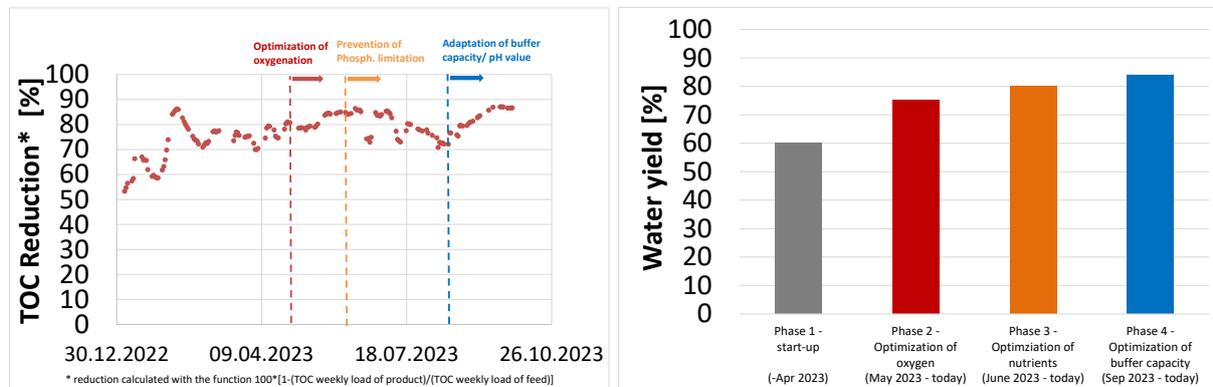


Figure 2. Performance of the pilot plant in terms of TOC reduction of biological step and recovery rate

A decisive factor for economic viability is the frequency of cleaning as a direct impact on self-consumption of water, downtime, and thus the yield of the membrane stages. An unfavourable burden on the microorganisms in the biological stage must be avoided, as this results in higher loads for the membrane stages, which then have to undergo more frequent cleanings. The composition and concentration of the remaining organic matter, which then determines the final water quality, are also affected.

The substrate selection, the smoothening of the fluctuations in feed quality, the avoidance of nutrient limitations, and the stabilization of the pH value are particularly decisive for this as for example lower TOC values in the effluent of biological treatment result (see figure 2). As a result of all optimizations conducted so far, the system can now be operated with a water yield of up to 85 %.