AquaNES

Demonstrating Synergies in Combined Natural and Engineered Processes for Water Treatment Systems

Riverbank filtration coupled to reverse osmosis: cNES pilot experience in Budapest, Hungary

Challenge

Drinking water production of Budapest is based 100% on river bank filtration (RBF) from the Danube River

The cNES of RBF and UF/RO examined :

- To investigate the effectiveness of micropollutant removal
- Collecting RBF/RO operational experience and water quality data during the pilot period
- Analysing the effect of extreme weather conditions (drought period) on the RBF/RO coupled technology

Figure 1. Pilot site location

Technical demonstration

- Continuous pilot operation for 7 months (extreme low water flow period included)
- Site: right bank of the Danube, inside Budapest
- Treatment steps are: river bank filtration → safety prefiltration (400 µm) → ultrafiltration (~0.03 µm) → antiscalant dosing → reverse osmosis (RO) → (pH setting, re-mineralization – optional)
- Sampling of Danube River water, RBF water, RO permeate twice a week

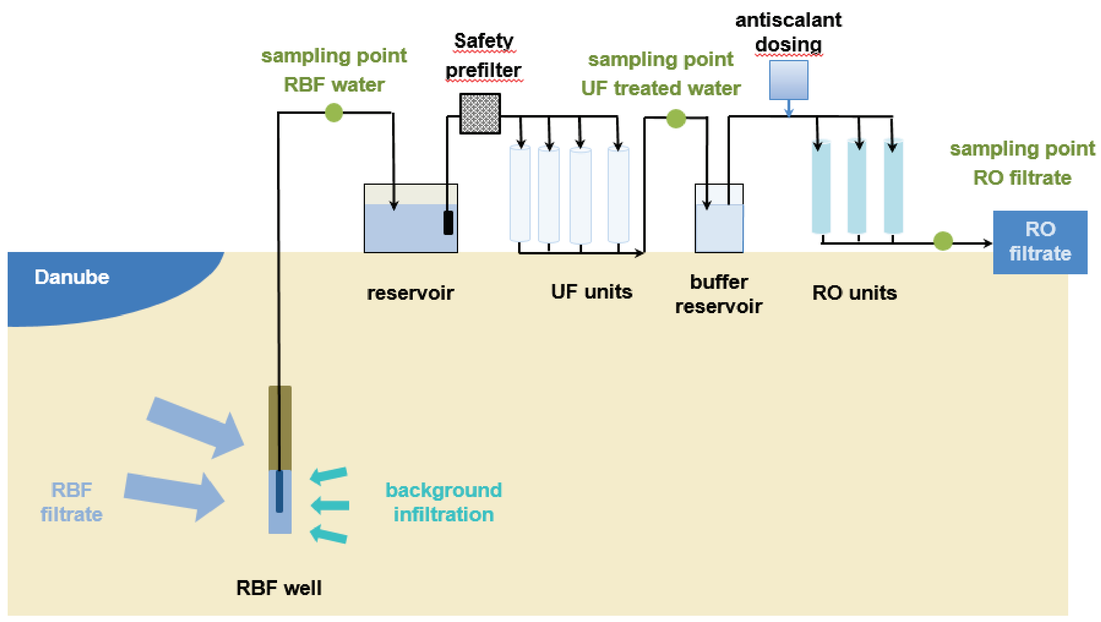

Figure 2. Pilot site installation

Expected benefits

- Efficient micropollutant removal that remains after RBF/arrives from the background
- Provide constant clean water quality, even in extreme hydrological conditions
- Quality of RBF water is satisfactory to feed the RO without sophisticated pre-treatment steps
- Investigate the potential operational limitations and operating costs of RO technology.
- Comparison of the installation with other cNES systems in efficiency, costs & results.

Results

- Iron and manganese – downstream RO treatment all samples were below detection limit both for iron and manganese.
- Microbiological parameters – RBF and RO treated samples contained no detectable microorganisms in 99.4% of the samples.
- Organic micropollutants (pesticides & PAH compounds) – aldrine, trifluraline, hexachlor-benzene, alpha-endosulphane, endrine, gamma-HCH-lindane, 4,4'-DDD, 4,4'-DDT compounds were below detection limit in all samples & no sample exceeded the regulatory limit for total PAH concentration of 0.10 µg/l.

These results indicate that the Danube is only slightly polluted considering the investigated spectra of chemicals but these could be effectively treated by RBF processes and the RO could further reduce these micropollutants if any remains.

Conclusions

- Long-term continuous operation of RO is possible in combination with bank filtration, without frequent RO membrane cleaning
- Excellent micropollutant removal
- High water loss rate (over 15%), concentrate has to be treated in accordance with local regulations
- High chemical agent and energy demand – highest comparing other treatment technologies
- Recommended in case if any other alternative fails

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