In-out ultrafiltration in tertiary wastewater applications — Comparison of different operational strategies

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ABSTRACT
Regional water scarce, climate change and environmental requirements are making waste water re-use a feasible alternative on the industrial and municipal water supply sector. Nowadays, ultrafiltration plays a major role in the treatment of municipal and industrial tertiary waste water. It is an ideal stand-alone technology to treat waste water and produce a constant quality treated water which is used mainly for irrigation, aquifer replenishment or as a pretreatment to a reverse osmosis step. Due to the UF particles, bacteria and even viruses are rejected. Depending on the quality of the secondary effluent in regard of potential membrane foulants (e.g. dissolved or colloidal organic substances), operating parameters and required chemicals for the pretreatment (e.g. coagulants) and different cleaning processes can have a significant impact on the design and also on the capital and on the operational costs. This paper presents investigations and optimization of different operating strategies to ensure a proper UF system design while ensuring reliable operational parameters and trustworthy costs. Results shown in the paper originate from several pilot tests and full-scale experiences in different countries. The standard inge® UF membrane process for tertiary effluent treatment using continuous inline coagulation and automatic chemical enhanced backwashes (CEB) is compared to three UF pretreatments variants associated to their own operating process: 1) UF pretreatment with (biological active) sand / gravel filtration, 2) advanced coagulation process (intermittent inline coagulation upstream UF) and 3) finally operation without addition of coagulant. The obtained information and experiences are compared and evaluated in regard of the overall UF design and cost impacts as well as UF filtrate quality. The paper proves that the operational costs can be significantly reduced when applying an intermittent inline coagulation as coating process.

Keywords: Inline coagulation; Reuse; Ultrafiltration; Wastewater

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