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Filter Loading Evaluation for Water Reuse

Principal Investigators: Bahman Sheikh, Kara Nelson, Robert Holden, James Crook, Robert Cooper, Gordon Williams, Tom Kouretas

Cash Contributors (in addition to the Bureau of Reclamation): State Water Resources Control Board (CA)

Objectives:

Filter Loading Evaluation for Water Reuse was inspired by the Monterey Regional Water Pollution Control Agency (MRWPCA) because of its need to produce greater volumes of recycled water during the peak irrigation months. The objective of this project was to establish the potential to produce disinfected tertiary recycled water at filter loading rates higher than currently allowed by the California Water Recycling Criteria without sacrificing water quality. Meeting this objective would enable an economically important objective of producing more recycled water using existing filters, thus saving millions of dollars by reducing the need to construct additional filter capacity in many California water recycling facilities.

Summary of Findings

- With all else equal, particle removal efficiency through the filters decreased as the loading rate increased
- Equivalent water could be produced at 5 and 7.5 gpm/ft^2 when coagulant dose was optimized independently for each rate (60% more coagulant used at the higher rate)
- Larger particles were removed more efficiently over the size range of 2 to 15 micrometers (μm).
- Viruses removed through filtration are primarily particle associated and the degree of particle association is dependent on the coagulant concentration.
- Equivalent filter effluent quality was produced at both filter loading rates with respect to turbidity, particle counts, and removal of indicator bacteria.
- The need for coagulant addition to achieve equivalent filter performance was site specific. The average coagulant dose necessary to achieve equivalent performance was 51 percent higher at the 7.5 gpm/ft^2 rate for one treatment facility, while at another facility equivalency was achieved without any coagulant addition.
- Operation at loading rates up to 7.5 gpm/ft^2 is being approved by the California Department of Public Health on a plant-by-plant basis

Recommendations

Further work in the following areas was recommended:

- Streamlining the regulatory process to allow water recycling agencies to load tertiary filters at the higher rates without having to undergo the rigorous protocols that MRWPCA has already done;
- Assisting the California Department of Public Health to revise Water Recycling Criteria to reflect the findings from this project in future filter designs;
- Addressing the regulatory discrepancies between virus disinfection using chloramines versus chlorine;
- Developing new real-time metrics for monitoring filter performance that are more comprehensive than the information provided by existing turbidimeters and particle counters;
- Further investigating the ability of enhanced coagulation to increase virus removal through filtration;
- Improving molecular techniques, such that they are better able to characterize removal mechanisms of indigenous organisms (especially human pathogenic viruses) through tertiary treatment processes; and
- Studying filter loading rates higher than 7.5 gpm/ft^2, both with and without pre-coagulation, at facilities that have a high quality secondary effluent.